

# EXHIBIT 5

IN RE: CAMP LEJEUNE                 )  
WATER LITIGATION,                  )  
  
Plaintiff,                      ) No. 7:23-CV-00897  
  
vs.                                    )  
  
UNITED STATES OF                  )  
AMERICA,                          )  
  
Defendant.                      )

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Notary Public in and for the State of Utah

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18 Bill Williams  
Dennis Reich  
19 Deanna Havai  
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20 Morris Maslia  
Jeffrey Davis  
21 Allison O'Leary

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February 14, 2025

9:13 a.m.

P R O C E E D I N G S

THE VIDEOGRAPHER: Good

morning. We are going on the record at 9:13 a.m. on February 14, 2025. This is Media 1 deposition recording of Dr. Norman Jones, In the Matter of Camp Lejeune Water Litigation filed in the District Court for the Eastern District of North Carolina, Case Number 7:23-CV-00897.

This deposition is being held at the Attorney General's Office in Salt Lake City, Utah.

My name is McKayla Largin. I'm the videographer. And Vickie Larsen is the court reporter.

Will counsel please state who they represent for the video record.

MR. ANTONUCCI: Giovanni Antonucci for the United States.

MS. SILVERSTEIN: Kailey Silverstein for the United States.

MR. ANWAR: Haroon Anwar for the United States.



1 MS. BAUGHMAN: Laura Baughman  
2 for the plaintiffs.

3 MS. BOLTON: Devin Bolton for  
4 the plaintiffs.

5 THE VIDEOGRAPHER: Will the  
6 court reporter please swear in the  
7 witness.

8 NORMAN L. JONES,  
9 called as a witness, having been duly sworn,  
10 was examined and testified as follows:

11 EXAMINATION

12 BY MR. ANTONUCCI:

13 Q. All right. Good morning.

14 A. Good morning.

15 Q. Please state your full name.

16 A. Norman Lovell Jones.

17 Q. And can you please state your  
18 current address.

19 A. 4174 North 430 East, Provo,  
20 Utah.

21 Q. Well, good morning, Dr. Jones.  
22 My name is Giovanni Antonucci, as you just  
23 heard. I'm an attorney for the Department of  
24 Justice. I represent the United States in  
25 the Camp Lejeune Water Litigation that's

1 currently pending in the District Court for  
2 the Eastern District of North Carolina.

3 Dr. Jones, have you ever had  
4 your deposition taken before?

5 A. Yes.

6 Q. How many times have you had  
7 your deposition taken before?

8 A. Once.

9 Q. And what was the nature of the  
10 case in which you were deposed?

11 A. I was the class representative  
12 on a class action lawsuit against the Traeger  
13 company. And I can't remember the exact  
14 date, a year and a half, two years ago, I had  
15 a seven-hour deposition as part of that.

16 Q. Is the Trager company the same  
17 company that manufactures grills?

18 A. Yes.

19 Q. Okay. All right. We'll come  
20 back to discuss that, but I'd like to get  
21 through a few more sort of ground rules, if  
22 that's all right with you.

23 A. Sure.

24 Q. So you just took an oath;  
25 right?

1           A.       Right.

2           Q.       Do you understand the nature of  
3       that oath?

4           A.       Yes.

5           Q.       That oath requires you to fully  
6       answer each question. If you're not sure of  
7       an answer or don't have a complete answer,  
8       you must still answer the question to the  
9       extent that you can.

10                   Do you understand?

11          A.       Yes.

12          Q.       As you can see, a court  
13       reporter is taking down everything that we  
14       say. Because she can only record words, it's  
15       important that you answer questions verbally.

16                   For example, you must say "yes"  
17       are or "no" rather than shaking or nodding  
18       your head. Do you agree to do that?

19          A.       Understood, yes.

20          Q.       Please speak at a slow pace so  
21       that the court reporter can record  
22       everything. I will do my best to do the  
23       same.

24                   We should also try not to  
25       interrupt one another; otherwise, our court

1 reporter will not be able to record us  
2 accurately.

3 Please wait until I finish my  
4 question before you start to answer, and I  
5 will not interrupt you while you are  
6 speaking.

7 Sound good?

8 A. Sounds great.

9 Q. Once the deposition is  
10 complete, you'll be given an opportunity to  
11 read a transcript of your testimony and make  
12 any corrections. You will then be asked to  
13 sign it.

14 Is that all right with you?

15 A. Sounds great.

16 Q. Dr. Jones, only you are  
17 testifying today. You must answer to the  
18 best of your ability and you may not ask  
19 others for their help.

20 Do you understand?

21 A. Yes.

22 Q. If you don't understand one of  
23 my questions, please let me know and I will  
24 try to clarify. However, if you don't ask  
25 for clarification, I will assume that you

1 understood the question; is that fair?

2 A. Yes.

3 Q. During the deposition you may  
4 hear other attorneys say "objection" and  
5 state an objection. Unless you've been  
6 instructed not to answer the question, please  
7 answer the question after the objection has  
8 been made.

9 Do you understand?

10 A. Understood, yes.

11 Q. Is there any reason why you're  
12 unable to give your most truthful and  
13 accurate testimony today?

14 A. No.

15 Q. Is there any reason your memory  
16 might be impaired today?

17 A. No.

18 Q. Have you taken or do you intend  
19 to take today any medication that might  
20 affect your ability to testify accurately or  
21 honestly?

22 A. No.

23 Q. Dr. Jones, you can ask for a  
24 break at any time. Please don't hesitate to  
25 ask for breaks. All I ask is that you answer

1 any question that's pending before we go on  
2 the break.

3 Does that sound good?

4 A. Sounds good.

5 Q. Am I correct that you've been  
6 retained by plaintiff's leadership group as  
7 an expert witness in the In Re: Camp Lejeune  
8 Water Litigation pending in the United States  
9 District Court for the Eastern District of  
10 North Carolina?

11 A. Yes.

12 Q. When were you hired as an  
13 expert witness?

14 A. September of 2024.

15 Q. Do you remember the specific  
16 date?

17 A. I don't remember the exact  
18 date. Earlier in the month, I believe.

19 Q. And who hired you?

20 A. The -- the Bell Legal Group, I  
21 think it's called.

22 Q. Okay. Were you dealing with  
23 attorney Kevin Dean at that time?

24 A. Yes.

25 Q. Before you were retained, had

1       you ever heard about Camp Lejeune?

2               A.       I'd heard of it, yes.

3               Q.       Had you heard of the existence  
4       of the camp in general, or more specifically  
5       the water contamination issues?

6               A.       I'd heard -- I was aware of the  
7       existence of the camp, and I was aware that  
8       there was some groundwater contamination at  
9       the camp, and there was some -- there was --  
10      yeah, I was aware that it was being studied  
11      and analyzed.

12              Q.       How did you become aware of the  
13      water contamination?

14              A.       You know, I -- I'm not sure I  
15      remember. One of those things that I recall  
16      knowing vaguely about it, but I never  
17      investigated it deeply prior to that time.

18              Q.       Do you recall when you first  
19      learned about the water contamination issues  
20      at Camp Lejeune?

21              A.       No, I don't.

22              Q.       Was it prior to 2022?

23              A.       I don't think so, but I can't  
24      be sure.

25              Q.       Is it possible you learned

1 about the issues from attorney advertising?

2 MS. BAUGHMAN: Objection.

3 Form.

4 THE WITNESS: I can't say. I  
5 don't remember.

6 Q. BY MR. ANTONUCCI: Sure. Had  
7 you heard about Camp Lejeune in your  
8 professional capacity?

9 A. Again, I -- I don't recall. I  
10 didn't know a lot about it, so it's hard for  
11 me to pin down where I -- where I heard about  
12 it. Just was vaguely aware that there was a  
13 groundwater contamination issue there.

14 MR. ANTONUCCI: Okay. I am  
15 going to ask that Exhibit 1 be marked  
16 for identification.

17 (Exhibit 1 was marked for identification.)

18 Q. BY MR. ANTONUCCI: Dr. Jones,  
19 please take a moment to look that over.

20 A. Okay.

21 Q. Have you finished reviewing  
22 Exhibit 1?

23 A. Yes.

24 Q. Have you seen this document  
25 before?



1           A.       Yes.

2           Q.       When have you seen it before?

3           A.       It was sent to me, I believe,  
4 by email a few weeks ago.

5           Q.       Okay. I'll represent to you  
6 that that's the notice of deposition and  
7 subpoena that I issued for your testimony  
8 here today.

9           A.       Okay.

10          Q.       Does that generally comport  
11 with your understanding?

12          A.       That is what I would have  
13 guessed, yes.

14          Q.       Okay. I'd appreciate it if you  
15 could turn to Attachment A, which is towards  
16 the end of the document.

17                   So Attachment A states  
18 "Pursuant to Federal Rules of Civil Procedure  
19 39(b)(2) and 45, the United States makes the  
20 following requests for the production of  
21 non-privileged documents, communications, and  
22 materials, including but not limited to, any  
23 electronically stored information, data,  
24 technical files, and photographs, within your  
25 possession, custody, or control:

1                   "Number 1. All emails,  
2 letters, correspondence, text messages,  
3 conversations, chats, voicemails, data,  
4 technical files, or other communications  
5 pertaining to Camp Lejeune sent or received  
6 prior to your retention as an expert in this  
7 matter, including but not limited to, from,  
8 or with:

9                   "Morris Maslia, Robert Faye,  
10 Jason Sautner, David Savitz, Rene  
11 Suarez-Soto, Susan Martel, Scott Williams,  
12 Frank Bove, Mike Partain, Jerry Ensminger,  
13 Lori Freshwater."

14                   Did I read that correctly?

15           A.       I believe so, yes.

16           Q.       Do you have any emails,  
17 letters, correspondence, text messages,  
18 conversations prior to your retention with  
19 any of those individuals?

20           A.       Not related to Camp Lejeune.

21           Q.       Do you have any emails,  
22 letters, correspondence, text messages,  
23 conversations, chats, voicemails, data,  
24 technical files or other communications  
25 pertaining to Camp Lejeune prior to your

1 retention -- excuse me -- not pertaining to  
2 Camp Lejeune from prior to your retention  
3 with any of those individuals?

4 A. Yes.

5 Q. May I ask who?

6 A. Morris Maslia.

7 Q. Okay. What sort of  
8 communications had you had with Mr. Maslia  
9 prior to your retention as an expert in this  
10 case?

11 A. So -- so for several years he  
12 and I both served together on a peer-review  
13 panel for a research project at the  
14 University of Alabama, and I was the chair of  
15 that expert panel and Morris was a member of  
16 the panel.

17 So in the context of reviewing  
18 that research project, we had correspondence.

19 Q. Okay. Before we discuss that  
20 more, is there anyone else on that list with  
21 whom you've had any communications prior to  
22 your retention as an expert in this case?

23 A. No.

24 Q. Other than your dealings with  
25 the expert panel and Mr. Maslia, do you have

1 any other communications with him prior to  
2 your retention as an expert?

3 A. No.

4 Q. Okay. So you mentioned that  
5 your work with Mr. Maslia was through the  
6 University of Alabama; is that right?

7 A. Yes. There's a -- a National  
8 Science Foundation-funded project where the  
9 principal investigators at the University of  
10 Alabama, it also involves other universities,  
11 Louisiana State University, University of  
12 Mississippi, Auburn, a number of other  
13 smaller universities.

14 Q. And you mentioned serving on  
15 an -- or excuse me -- serving as the chair of  
16 an expert panel on which Mr. Maslia also  
17 served; is that right?

18 A. That's correct.

19 Q. What were you evaluating?

20 A. So based on the rules and  
21 protocols for that grant established by the  
22 National Science Foundation, they were  
23 required to, every year, bring in an outside  
24 panel to review their work to give feedback,  
25 make sure they're following good research

1 standards and making good progress.

2 And so once a year we would  
3 read the report that they had generated, and  
4 then we would travel to Alabama and  
5 participate in a two-day workshop,  
6 presentations, and then we would write a  
7 report with recommendations and observations  
8 we make during the review process, and we did  
9 that three times.

10 Q. Okay. So you've mentioned  
11 providing feedback, ensuring good research  
12 standards, and good progress?

13 A. Yes.

14 Q. What is the project that you  
15 were evaluating for those criteria?

16 A. It was a very broad project,  
17 but the primary objective was to do research  
18 on groundwater in -- in the Southeast United  
19 States. Looking at groundwater recharge,  
20 looking at evaluating groundwater storage  
21 change, things like that.

22 And they also used, developed,  
23 and applied some groundwater models as part  
24 of the project.

25 Q. So my understanding of recharge

1 and storage change is that those are  
2 parameters that pertain to the amount of  
3 water contained in an aquifer; is that right?

4 A. Yeah, recharge is typically the  
5 water that comes from rainfall that as a  
6 portion of that eventually percolates down  
7 and enters the aquifer. It's the primary  
8 source of water to an aquifer.

9 And then the storage change  
10 is -- it's dependent on the water balance,  
11 how much water is coming in versus how much  
12 water is being discharged to springs and  
13 streams and being pumped out by wells.

14 Q. And you mentioned this was the  
15 Southeast United States. Was this the  
16 Floridian aquifer?

17 A. They studied, I know, aquifers  
18 in Mississippi and Alabama, and there was a  
19 very large model built in the state of  
20 Louisiana by the researchers from Louisiana  
21 State University.

22 Q. What was the purpose of the  
23 applied groundwater models that they were  
24 developing?

25 A. Partially to look at storage

1 change and aquifer sustainability. And,  
2 again, determination of recharge rates was  
3 one of the things that was studied.

4 And they're also looking at, I  
5 believe, innovative numerical algorithms and  
6 methods for analyzing aquifers, determining  
7 recharge rates.

8 For example, the -- they used  
9 not just in-situ data from monitoring wells,  
10 but earth observations from satellite data.

11 Q. So I'd like to sort of break  
12 that down a little bit more with you.

13 A. Sure.

14 Q. You mentioned that the purpose  
15 of evaluating storage change and recharge is  
16 to evaluate aquifer sustainability; am I  
17 stating that correctly?

18 A. That's one of the purposes,  
19 yes.

20 Q. Okay. What are the other  
21 purposes?

22 A. To -- water resource planning.  
23 When your -- groundwater is one of our most  
24 significant sources of fresh water. For  
25 example, in a drought when the stream flow is

1 low, sometimes you pump more groundwater to  
2 make up that deficit, so it's a -- it's a  
3 large, underground reservoir.

4 So much of the work we do in  
5 groundwater studies is to assess how our  
6 groundwater storage is changing over time and  
7 how to characterize that and how to predict  
8 how it will respond in the future, and that  
9 happens to be one of my -- one of my areas of  
10 research as well.

11 Q. So if I'm understanding  
12 correctly, the purpose of this project at the  
13 University of Alabama was, at least in part,  
14 to assess sustainability for planning  
15 purposes; is that right?

16 A. That's one of the objectives,  
17 that's right.

18 Q. Okay. Can you please list the  
19 other objectives.

20 A. You know, it's been almost two  
21 years since our last review, so I'm not sure  
22 I could add much beyond what I've stated in  
23 terms of detail without looking up the  
24 reports and reviewing it.

25 Q. Sure.



1           A.       You know, and a big part of the  
2 project is also public education and  
3 outreach. So they -- they had a lot of  
4 funding to -- to work with K through 12 and  
5 provide high school science teachers, for  
6 example, with material and understanding  
7 aquifers and aquifer dynamics.

8                   And so it -- it was a -- it was  
9 a very broad project. They looked at machine  
10 learning algorithms for different kinds of  
11 data analysis related to groundwater data.  
12 It was very broad.

13                   They had, I think, maybe as  
14 many as 80 people on this project. It was  
15 one of the bigger research projects I've ever  
16 seen.

17           Q.       What was the process like to be  
18 selected as the chair of the expert panel?

19           A.       I -- so I was the princ- --  
20 this grant was through what's called the  
21 EPSCoR project, E-P-S-C-O-R, the EPSCoR  
22 program through the National Science  
23 Foundation.

24                   And from 2010 to 2014 I  
25 happened to be the principal investigator of

1 an EPSCoR grant, a \$6 million EPSCoR grant  
2 featuring Brigham Young University,  
3 University of Utah, Utah State University,  
4 and University of Wyoming.

5 And the -- the principal  
6 investigator of the project centered in  
7 Alabama. It was an associate of mine and he  
8 was aware of that and thought that my  
9 experience and also my general background and  
10 experience in groundwater would -- would make  
11 me a -- a good pick for that role.

12 Q. And do you know how any of the  
13 other panel members were selected?

14 A. They were selected by the --  
15 they were asked to serve on behalf of the  
16 principal investigator of that project, which  
17 is Prabhaker Clement.

18 Q. You mentioned previously that  
19 part of the objective of the expert panel was  
20 to provide feedback, evaluate research  
21 standards, and ensure good progress?

22 A. Yeah.

23 Q. Am I stating that correctly?

24 A. Right.

25 Q. What kinds of -- of research

1 standards were you looking for in this  
2 project?

3 A. Well, they would make  
4 presentations on -- on their findings and the  
5 methodologies they were using, review journal  
6 articles that they had published or in the  
7 process of working on and, you know, in some  
8 cases we would give advice on -- on  
9 methodology, suggestions on -- on different  
10 kinds of computer algorithms to help, you  
11 know, based on our experience.

12 But, overall, it was a very  
13 impressive project and they -- they've been  
14 doing excellent work.

15 Q. You mentioned --

16 A. So we didn't -- we didn't -- I  
17 don't recall any highly critical feedback  
18 that we gave. Fortunately, it's a really --  
19 really well-run project.

20 Q. So you just mentioned  
21 evaluating the methodology; is that correct?

22 A. Yeah.

23 Q. How did you go about evaluating  
24 the methodology of this groundwater modeling  
25 project?

1           A.       We would review the reports  
2       that they provided, the papers that they  
3       were -- that they had -- they were either  
4       preparing to submit or publishing, and two  
5       days of presentations that they would make  
6       each year.

7           Q.       Were you provided with the  
8       modeling files to evaluate?

9           A.       No.

10          Q.       Did you perform a post-audit of  
11       any kind of their work?

12          A.       No.

13          Q.       I'd like for you to sort of  
14       walk me through the process of evaluating the  
15       methodology of a groundwater modeling  
16       project --

17          A.       Sure.

18          Q.       -- if that's all right.

19          A.       Yeah.

20          Q.       I guess maybe we can start with  
21       the conceptual model.

22          A.       Yeah.

23          Q.       My understanding is that's kind  
24       of where modeling begins; is that right?

25          A.       That's right.

1           Q.       So what did you do to evaluate  
2       the conceptual model of this project from the  
3       University of Alabama?

4           A.       Well, there's not one model,  
5       there were -- there were multiple models.  
6       The -- they provided a general description of  
7       the conceptual model, and for the Louisiana  
8       model there was a presentation and some  
9       written material where they described the  
10      basic components of the conceptual model.

11          Q.       Did your evaluation of the  
12      conceptual model involve evaluating the  
13      purpose for which the model was designed?

14          A.       They -- they described the  
15      purpose, I believe, that -- in -- in -- for  
16      the Louisiana model, it was to look at water  
17      availability and long-term, again,  
18      sustainability, water balances.

19          Q.       And, again, that's for planning  
20      purposes; right?

21          A.       But that's -- I'm going by  
22      memory. I'm quite sure that's what it was,  
23      but it's been a while.

24          Q.       Of course. Completely  
25      understandable.

1                   The -- what you just stated,  
2           the evaluating sustainability and planning  
3           purposes. My understanding is that your  
4           primary memory of what the projects are for  
5           as it stands today is that it was a planning  
6           project; is that right?

7           A.       They -- I -- what -- from what  
8           I recall, it's been a while, it was develop a  
9           very sophisticated model of the aquifers in  
10          Southern Louisiana to characterize the  
11          groundwater flow and the long-term changes in  
12          groundwater storage --

13          Q.       And it was --

14          A.       -- and then the dynamics of the  
15          aquifer.

16          Q.       Excuse me. I didn't mean to  
17          cut you off.

18                   That was to determine the  
19          future availability of groundwater?

20          A.       It's one of the objectives, I  
21          believe, yes.

22          Q.       Okay. And you can't remember  
23          any other objectives today?

24          A.       No.

25                   MS. BAUGHMAN: Objection.

1 Form.

2 Q. BY MR. ANTONUCCI: All right.  
3 You mentioned there were multiple models that  
4 you were evaluating. Can you provide a  
5 general overview of what those models were.

6 A. I don't remember the other  
7 cases as well. I'm not sure there were  
8 models as much as aquifer studies. That's  
9 the one I remember most, because it was the  
10 most significant model, Louisiana model. I'm  
11 not sure I could comment on the others. My  
12 memory is more fuzzy with regard to that.

13 Q. Okay. Moving on from the  
14 conceptual model. Did you evaluate their  
15 selection of a mathematical model?

16 A. I know they -- they used  
17 MODFLOW.

18 Q. Okay. Are there different  
19 options for equations -- governing equations  
20 that can be used in MODFLOW?

21 A. No. There's one governing  
22 equation that the model is built around.

23 Q. Okay. Did you evaluate the  
24 process of model calibration?

25 A. That was part of what they

1 presented, yes.

2 Q. Okay. What factors did you  
3 look at when evaluating calibration?

4 A. Just -- I -- I don't remember  
5 the details. I remember they -- they did an  
6 extensive calibration process, but it seemed  
7 fairly standard, as I recall.

8 Q. Do you know if they used  
9 perimeter estimation tools?

10 A. I don't remember for sure, but  
11 I believe they did. It's fairly typical to  
12 use automated parameter estimation on a large  
13 model like that.

14 Q. Is it also typical to do some  
15 manual parameter estimation as well?

16 A. Oh, yes. Yeah, always.

17 Q. Do you generally start with  
18 manual parameter estimation?

19 A. In general --

20 MS. BAUGHMAN: Objection.

21 Form.

22 THE WITNESS: It's generally  
23 good practice to start with manual  
24 calibration before you engage the use  
25 of software to help calibrate a model.



1 Q. BY MR. ANTONUCCI: My  
2 understanding is that one of those software  
3 codes is called PEST for parameter  
4 estimation; is that right?

5 A. That's correct.

6 Q. That was created by John  
7 Doherty?

8 A. That's correct.

9 Q. Do you know if the model you  
10 evaluated used the PEST code?

11 A. I don't recall.

12 Q. What other factors did you  
13 evaluate for in your analysis of their  
14 calibration?

15 A. I don't recall.

16 Q. Did you evaluate the  
17 sensitivity analysis performed by the  
18 investigators of the study?

19 A. I don't recall.

20 Q. Is it typical to analyze the  
21 sensitivity analysis of a groundwater model  
22 when reviewing the methodology?

23 MS. BAUGHMAN: Objection.

24 Form.

25 THE WITNESS: Will you state

1           that again.

2           Q.       BY MR. ANTONUCCI:   Sure.

3       I'll -- I'll restate my question.

4                   When you are evaluating a  
5       groundwater model's methodology, is it  
6       typical to evaluate the sensitivity analysis?

7           MS. BAUGHMAN:   Objection.

8           Form.

9                   THE WITNESS:   If -- if they  
10       performed a sensitivity analysis, you  
11       would review that, yes.

12          Q.       BY MR. ANTONUCCI:   Okay.   So  
13       based on that answer, it seems like it's not  
14       a guarantee that a sensitivity analysis will  
15       be done for every model; is that right?

16          A.       Not necessarily.

17          Q.       Okay.

18          A.       Yeah.

19          Q.       How about uncertainty analysis?  
20       Is that typically done for most models?

21          A.       It is done for some models.

22          Q.       Okay.   What factors do you look  
23       at when you're evaluating uncertainty  
24       analysis?

25                   MS. BAUGHMAN:   Objection.

1 Form.

2 THE WITNESS: When I'm -- when  
3 you're performing a sensitivity  
4 analysis on the model? Is that the  
5 question?

6 Q. BY MR. ANTONUCCI: I'm asking  
7 now about as a peer reviewer --

8 A. Yeah.

9 Q. -- when you're evaluating the  
10 methodology of a groundwater model, you're  
11 looking at the uncertainty analysis. What  
12 factors do you look at?

13 MS. BAUGHMAN: Objection.

14 Form.

15 THE WITNESS: The methodology  
16 they use to perform the uncertainty  
17 analysis.

18 Q. BY MR. ANTONUCCI: Can you  
19 elaborate on that? What -- what are the sort  
20 of --

21 A. Well --

22 MS. BAUGHMAN: Objection.

23 Form.

24 THE WITNESS: There are  
25 different ways one can go about an

1           uncertainty analysis, but the general  
2           process is typically basically the  
3           same from one case to another.

4           Q.           BY MR. ANTONUCCI:   Okay.   Can  
5           you explain that general process.

6           A.           Well, typically one would first  
7           calibrate a model to come up with a best  
8           estimate of the parameters of the model and  
9           the features of the model that reproduce  
10          the -- the behavior exhibited by the aquifer  
11          in the field.

12                       And then -- then you look at  
13          your parameters and for -- for the selected  
14          set of parameters, you look at the  
15          uncertainty in that parameter typically with  
16          the use of a probability distribution  
17          function.

18                       And then to perform the  
19          uncertainty analysis, you generate a large  
20          number of model instances, versions of the  
21          model.   In each case where -- for the  
22          parameters you've selected, you perturb the  
23          parameter value within the range of values  
24          you determined would be reasonable to expect  
25          for that parameter.

1                   And that gives you a -- a  
2                   number of models. And if you do it right,  
3                   each of those models are considered equally  
4                   probable.

5                   And then you run your  
6                   simulation for each of those, and then you  
7                   evaluate the outcome you're looking at, and  
8                   then you can get that -- that allows you to  
9                   get a probability of a certain outcome or a  
10                  confidence interval for a range of outcomes,  
11                  and this is often called a Monte Carlo  
12                  process.

13                 Q.           The uncertainty analysis is  
14                 evaluating the probability of all possible  
15                 model solutions; is that right?

16                 A.           Of a range of model solutions  
17                 that are considered to be likely or probable  
18                 as being -- or considered to be possible.  
19                 Variations of the model.

20                 Q.           All right. Thank you. I  
21                 didn't mean to sidetrack the discussion so  
22                 much with that. I appreciate you providing  
23                 that information. You can put Exhibit 1 to  
24                 the side, please.

25                               What did you do to prepare for

1 your deposition today, Dr. Jones?

2 A. I primarily reviewed the -- the  
3 ATSDR reports and our model reports.

4 Q. I see that you have some stacks  
5 of paper in front of you; is that right?

6 A. Yeah.

7 Q. What are those?

8 A. I have Chapter A, ATSDR  
9 Chapter A. Chapter F. And then I have a  
10 copy of the rebuttal report that Jeff Davis  
11 and I submitted in January of this year.

12 Q. And I see those are tabbed with  
13 sticky notes; is that right?

14 A. That's correct.

15 Q. What sections did you tab in  
16 Chapter A?

17 A. I put some tabs in for some  
18 figures that I thought -- primarily figures I  
19 thought might be useful that I think are  
20 important in the -- in the analysis -- in the  
21 review of the work, one of which is  
22 Figure A18, Chapter A. Another of which is  
23 A26 in Chapter A.

24 And in Chapter F I have tagged  
25 Figure F12, the scatter plot simulated versus

1 observed for the MT3DMS model. Page F34  
2 which shows the -- the time series of PCE at  
3 Well TT-26 versus the observed values. And  
4 F43, which is the simulated and observed  
5 concentrations at the Tarawa Terrace water  
6 treatment plant.

7 Q. Did you make any handwritten  
8 notes in those?

9 A. No.

10 Q. Did you make any highlights?

11 A. No.

12 Q. Did you do anything other than  
13 tab those documents?

14 A. No.

15 Q. And I see you also have the  
16 rebuttal report; is that right?

17 A. Yes. In the rebuttal report I  
18 have tagged the "Summary of Opinions" page, I  
19 have tagged at the beginning of the figures  
20 page and -- or excuse me -- the figure  
21 section in case I want to refer to some of  
22 the figures. Specifically Figure 2 and  
23 Figure 5.

24 And then I've tagged the --  
25 where the maps of the contaminant plumes

1 begin in the Appendix A7.

2 Q. Did you make any notes in your  
3 copy of the rebuttal report?

4 A. No.

5 Q. Did you make any highlights?

6 A. No.

7 Q. Did you do anything other than  
8 tab the pages you just mentioned?

9 A. No.

10 Q. So, Dr. Jones, I'm sorry to do  
11 this, but I'm going to ask you to put those  
12 to the side to --

13 A. Okay.

14 Q. -- ensure we're looking at the  
15 same copies of the documents today.

16 A. That's fine.

17 Q. Thank you. I appreciate that.

18 MS. BAUGHMAN: But obviously if  
19 he wants to refer to his copies, he  
20 can.

21 MR. ANTONUCCI: We're going to  
22 use the copies that were produced.

23 MS. BAUGHMAN: He can refer to  
24 his tabbed copies if he wants to.

25 MR. ANTONUCCI: We can tab the



1           produced copies at a break.

2           MS. BAUGHMAN: Norm, you can --  
3           you can look at your version if you  
4           want to, if it's helpful. It's the  
5           same thing.

6           MR. ANTONUCCI: All right, then  
7           I'm going to ask that those be marked  
8           as exhibit.

9           MS. BAUGHMAN: That's fine.

10          MR. ANTONUCCI: All right.

11          Q.       So other than reviewing those  
12       documents which you've tabbed, have you done  
13       anything else to prepare for your deposition?

14          A.       Just discussed with the legal  
15       team the format and what to expect. The  
16       procedure and methodology.

17          Q.       When you say "legal team," are  
18       you referring to Ms. Baughman and Ms. Bolton?

19          A.       That's correct.

20          Q.       Are you also referring to  
21       Mr. Dean?

22          A.       No -- there were -- I guess he  
23       was briefly involved in some of the  
24       discussions, yeah. Yeah, he was involved.

25          Q.       Were there any other attorneys

1       you spoke with?

2               A.       Not that I recall, no.

3               Q.       Was anyone else present at  
4       those meetings?

5               A.       Jeff Davis.

6               Q.       Was Mr. Davis present for every  
7       meeting you had with the legal team?

8               A.       No.   Most of them.

9               Q.       Other than Mr. Davis, was  
10      anyone else present?

11              A.       No.

12              Q.       Approximately how many times  
13      did you meet with the legal team to prepare  
14      for this deposition?

15              A.       We met on Monday -- or excuse  
16      me, I'm sorry -- Wednesday of this week.   We  
17      had dinner on Tuesday night.   Had dinner last  
18      night.

19              Q.       Approximately how long was your  
20      Wednesday meeting?

21              A.       Six or seven hours, I would  
22      guess.

23              Q.       Okay.   What did you discuss in  
24      that meeting?

25              A.       Again, what to -- how -- how a

1 deposition works. What -- what types of  
2 questions would -- we would expect to be  
3 asked. Don't talk over the question when  
4 it's being asked. Allow time for -- don't  
5 start speaking too soon. Allow time to make  
6 an objection, if necessary.

7 A lot of procedural coaching  
8 like that.

9 Q. Was there anything else?

10 A. Just a general review of the  
11 case and rebut- -- our opinions, and so  
12 forth.

13 Q. Were you provided with any  
14 documents in those meetings?

15 A. I don't recall, no.

16 Q. All right. Have you reviewed  
17 any of the other depositions taken in this  
18 case?

19 A. I reviewed the prelim- -- the  
20 draft transcript of the Mustafa Aral  
21 deposition that was taken recently. And I  
22 was on the Zoom yesterday. I watched most,  
23 but not all, of the Jeff Davis deposition.

24 Q. Have you reviewed any other  
25 depositions that have been taken in the Camp

1 Lejeune Justice Act litigation?

2 A. No.

3 Q. So you mentioned testifying in  
4 a deposition. I'm interested, have you ever  
5 testified at trial?

6 A. I testified at a court hearing  
7 in the -- in Carson City, Nevada, in front of  
8 the state engineer as part of a water rights  
9 dispute on two occasions where I was put  
10 under oath and questioned as an expert  
11 witness.

12 Q. Did you prepare a report in  
13 those cases?

14 A. Yes.

15 Q. But you weren't deposed?

16 A. I was not deposed, no.

17 Q. So you mentioned it was a water  
18 rights dispute. Can you --

19 A. Yes.

20 Q. -- explain in laymen's terms  
21 what that means.

22 A. So the -- the City of Las Vegas  
23 back in the 1980s decided that they needed to  
24 do something to ensure long-term water  
25 availability, and this organization later was

1 renamed The Southern Nevada Water Authority,  
2 it represents primarily Las Vegas, but also  
3 surrounding cities.

4 And they decided to pursue a  
5 groundwater development project where they  
6 would drill a series of deep production wells  
7 in some valleys in East Central Nevada, and  
8 build 300 miles of large pipe to pump that  
9 water south to Las Vegas.

10 It would have been a  
11 \$15 billion project, would have taken  
12 estimated 27 years to build. Would have been  
13 the largest inter basin transfer in history,  
14 the largest groundwater development project  
15 in history, and it would, as you can imagine,  
16 extract a significant amount of water from  
17 these valleys.

18 And I represented a significant  
19 landholder. I was -- I was retained as an  
20 expert witness for a landholder in Spring  
21 Valley that was one of several parties that  
22 were protesting the groundwater project.

23 And, yeah, we did a bunch of  
24 modeling simulations and wrote a series of  
25 reports related to the impact that project

1 would potentially have on the water rights,  
2 springs and streams and wells in the -- in  
3 this valley.

4 Q. How long ago was that?

5 A. I started in 2010 and the  
6 project -- it went on for ten years until it  
7 was concluded in 2020.

8 Q. Okay. So you already mentioned  
9 that you were deposed in a class action  
10 lawsuit where you served as a class  
11 representative. Is that suit ongoing?

12 A. It -- they've -- have --  
13 there's been a settlement in the last few  
14 months, so it's -- I think it's over.

15 Q. Okay. Other than that class  
16 action, have you ever been involved in any  
17 other litigation personally, not as an  
18 expert?

19 A. Involving me? No.

20 Q. And you mentioned starting work  
21 for the landholder in Spring Valley in 2010.  
22 Was that your first time serving as an expert  
23 witness?

24 A. No.

25 Q. When did you serve as an expert

1 witness prior to that?

2 A. Several years prior to that I  
3 was retained as -- to do a review of a case  
4 in Montana that a colleague of mine was  
5 involved with as the primary expert witness  
6 involving groundwater contamination at a --  
7 at a railroad facility.

8 Q. Who was that colleague?

9 A. Willis Weight.

10 Q. And do you recall which party  
11 you represented in that -- or excuse me --  
12 for which party you served as a witness in  
13 that case?

14 A. So Willis was hired as an  
15 expert to -- on the side of some plaintiffs  
16 who lived adjacent to a railroad facility,  
17 Burlington Northern and Santa Fe, and their  
18 contention was that contaminants had leached  
19 from an unlined pond or a poorly lined pond  
20 on the railroad facility and migrated under a  
21 neighborhood where they -- they had some  
22 drinking water wells, and that had caused  
23 some -- some health damages.

24 And so Willis built a MODFLOW  
25 and MT3D model simulating the migration of

1 the plume over to the property, and that was  
2 entered as evidence in the case.

3 And then the railroad hired  
4 Papadopoulos & Associates to -- to represent  
5 their side, and they -- the expert from  
6 Papadopoulos did a critical review of Willis'  
7 model.

8 So I was hired to review  
9 Willis' work and the Papadopoulos critique of  
10 his work and then write a report, which I  
11 believe became an affidavit that was entered  
12 in the case.

13 Q. So that I can understand, were  
14 you hired as an independent expert by the  
15 court or were you hired by --

16 A. No, I was hired by the  
17 plaintiff attorneys.

18 Q. Okay. So you submitted an  
19 affidavit in support of the plaintiff's  
20 reports; is that right?

21 A. It was based on my review of --  
22 of his modeling and the critique of that,  
23 yeah.

24 Q. Other than that Montana case,  
25 have you served as an expert witness in any



1 other cases?

2 A. Not that I recall.

3 Q. Do you know who specifically  
4 from S.S. Papadopoulos & Associates was the  
5 expert in that case?

6 A. I don't. It's been a number of  
7 years. No, I don't recall his name. He was  
8 one of their lead modelers, very well  
9 respected, I remember that.

10 Q. What was the contaminant of  
11 concern in that case? The Montana case.

12 A. Boy, it's been a long time. I  
13 know that it was a degreasing facility, but  
14 it might have been creosote. I wish I could  
15 remember. It's been probably 15, 20 years,  
16 yeah.

17 Q. Do you have an opinion about  
18 S.S. Papadopoulos as a firm?

19 MS. BAUGHMAN: Objection to  
20 form.

21 THE WITNESS: No.

22 Q. BY MR. ANTONUCCI: And you  
23 mentioned that your -- your colleague,  
24 Mr. Willis, simulated the flow of  
25 contamination through the -- through the

1 groundwater; is that right?

2 A. That's correct.

3 Q. And that was from the poorly  
4 lined pond to water supply wells; is that  
5 correct?

6 A. To the -- yes, to the area  
7 downgradient from the railroad facility where  
8 the water was pumped out, yeah.

9 Q. How far away from the pond were  
10 the water supply wells?

11 A. It -- it wasn't a great  
12 distance, but I -- I don't remember the exact  
13 distance.

14 Q. Do you know the total size of  
15 the area that was modeled?

16 A. I don't recall.

17 Q. And do you know what  
18 information was used to, for example, to  
19 select boundary conditions in that model?

20 A. I don't recall.

21 Q. Do you know what information  
22 was available in terms of heads and flow  
23 data?

24 A. I don't recall specifics.

25 Q. Do you know if there was heads

1 and flow data available to Mr. Willis?

2 A. I -- I believe there were, yes.

3 Q. Why do you believe that?

4 A. I -- if -- if there were not  
5 any data -- I know they had concentrations at  
6 the -- at the location where the water was  
7 being pumped out. That was the whole basis  
8 of the suit was they measured contaminants in  
9 their drinking water.

10 Q. When you say "the location  
11 where the water was pumped out," are you  
12 referring to the supply wells, the water  
13 treatment plant, or the tap?

14 A. I don't believe a water  
15 treatment plant was involved. There were --  
16 I -- from -- from what I recall, there were  
17 some small wells. I believe it was actually  
18 a -- part of a -- an Indian reservation, and  
19 they had some small water supply wells they  
20 were using.

21 Q. So it sounds like those samples  
22 were taken at the supply wells?

23 A. Yes, I believe so.

24 Q. Do you know approximately what  
25 time span those samples covered?

1 A. I don't recall.

2 Q. Was it more than a year?

3 A. I don't recall.

4 Q. Was it less than a year?

5 A. I don't recall.

6 Q. Do you know approximately how  
7 many data points they had?

8 A. I don't recall.

9 Q. Did they have -- strike that.  
10 With regard to the -- the head  
11 and flow data that you assumed that they had  
12 available, do you know how much of that was  
13 available?

14 A. I don't recall.

15 Q. Where do you -- in these kinds  
16 of cases, where do modelers normally get head  
17 and flow data from?

18 MS. BAUGHMAN: Objection.

19 Form.

20 THE WITNESS: Head and flow  
21 data? Well, you track down water  
22 level measurements from observation  
23 wells. In some cases, aquifers  
24 interact with streams, either  
25 discharge to streams or streams leak

1 water into the ground.

2 Sometimes you can look at  
3 gauges on the stream to get an  
4 estimate of -- of how much water's  
5 being gained or lost, but that is a  
6 fairly standard part of the data  
7 collection phase on the modeling  
8 project is to gather all the data you  
9 can find.

10 Q. BY MR. ANTONUCCI: Okay. And  
11 you mentioned that it was a lawsuit brought  
12 on behalf of the individuals who drank the  
13 water from those wells; is that correct?

14 A. That's correct.

15 Q. Do you know if the purpose of  
16 the model was to determine the absolute  
17 amount of contaminants that these individuals  
18 were exposed to?

19 MS. BAUGHMAN: Objection to  
20 form.

21 THE WITNESS: I don't recall.  
22 I know part -- at least part of the  
23 purpose was to determine if, presuming  
24 water leaked from the pond, would it,  
25 given the groundwater flow directions

1           and the timing, is it probable that it  
2           traveled -- that the contaminants were  
3           transported to that location where  
4           they could potentially be pumped out.

5           Q.           BY MR. ANTONUCCI:  So that's  
6           kind of a yes-or-no question, right?  Like,  
7           could the contamination have gotten to the  
8           well in that time period or not; right?

9           A.           Yeah.

10          Q.           Okay.  And that's the only  
11          purpose that you recall from that report?

12                       MS. BAUGHMAN:  Objection.  
13          Form.

14                       THE WITNESS:  That is a purpose  
15          that I recall.

16          Q.           BY MR. ANTONUCCI:  What other  
17          purposes do you recall?

18          A.           I -- I don't recall other  
19          purposes.

20          Q.           Okay.  Okay.  So prior to that  
21          Montana case, had you ever served as an  
22          expert witness before that?

23                       MS. BAUGHMAN:  In litigation?

24                       MR. ANTONUCCI:  Yes, in  
25          litigation.

1 MS. BAUGHMAN: Object to the  
2 form.

3 MR. ANTONUCCI: Have you --  
4 excuse me. I'm going to ask my  
5 question again.

6 Q. Prior to the Montana case, had  
7 you ever served as an expert witness in  
8 litigation?

9 A. I don't believe so. Not that I  
10 recall.

11 Q. Okay. Do you have a list of  
12 all the times you've served as an expert  
13 witness somewhere?

14 A. No.

15 MR. ANTONUCCI: Okay. All  
16 right. Actually, before we move on,  
17 I'm going to ask that the copies that  
18 you brought of the rebuttal report and  
19 Chapters A and F be marked for  
20 identification for Exhibits 2, 3,  
21 and 4.

22 (There was a discussion held off the record.)

23 (Exhibits 2-4 were marked for  
24 identification.)

25 MR. ANTONUCCI: Thank you for

1           that.

2                   And now I'm going to hand you  
3           another document. I'll ask that this  
4           be marked for identification as  
5           Exhibit 5.

6           (Exhibit 5 was marked for identification.)

7           Q.       BY MR. ANTONUCCI: Please let  
8           me know when you've had a chance to review  
9           that document.

10          A.       I'm ready.

11          Q.       Okay. Do you recognize  
12          Exhibit 5?

13          A.       Yes.

14          Q.       Okay. What is Exhibit 5?

15          A.       This is the CV that I  
16          submitted.

17          Q.       Okay. So if you turn to Page 1  
18          of Exhibit 5, it looks like this document is  
19          titled "Norman L. Jones, PhD, Professor,  
20          Department of Civil & Construction  
21          Engineering, Brigham Young University"; is  
22          that right?

23          A.       Correct.

24          Q.       Is this a complete and accurate  
25          copy of your resum??



1 A. Yes.

2 Q. Is there anything that you  
3 would like to change or add to this copy of  
4 your resume??

5 A. Can you clarify what you mean  
6 by "complete"?

7 Q. Sure. Is -- is this the most  
8 updated iteration of your resume??

9 A. This is the resume? -- resume?  
10 that I am currently using when my resume? is  
11 requested.

12 Q. Okay. So I'm inferring from  
13 your question that there's some things that  
14 are probably left off of this resume?; is that  
15 right?

16 A. That's correct. It's not  
17 100 percent inclusive of everything I've done  
18 in my professional career.

19 Q. Sure. What kind of things are  
20 currently listed on your resume? that's marked  
21 as Exhibit 5?

22 A. Oh, heavens. Consulting  
23 projects, expert witness work, workshops and  
24 courses I've taught, things like that.

25 Q. Have you served as a consulting

1 expert in litigation?

2 MS. BAUGHMAN: Objection to  
3 form.

4 THE WITNESS: A consultant --  
5 not beyond the cases we've described.

6 Q. BY MR. ANTONUCCI: Okay. Your  
7 resum? mentions a bachelor's, master's, and  
8 PhD in civil engineering. Did you have any  
9 specialization or concentration in those  
10 programs?

11 A. Yes. My master's degree and  
12 PhD at the University of Texas, I specialized  
13 in geotechnical engineering.

14 Q. And is there a list of your  
15 peer-reviewed publications from the last ten  
16 years on Page 3 of this resum??

17 A. Yes.

18 Q. How many of these publications  
19 deal with groundwater flow modeling?

20 A. You'll have to give me a  
21 minute. I would say of these, six are --  
22 five or six are directly related to a  
23 groundwater flow model and -- but a large  
24 number of them are for characterizing  
25 groundwater conditions, groundwater

1 sustainability.

2 Q. And how many of those deal with  
3 contaminant fate and transport modeling?

4 A. I'm not sure in this period --  
5 I got to read them again. I can see at least  
6 one.

7 Q. So just the one?

8 A. I believe so.

9 Q. Would it be fair to say that  
10 you focus more on groundwater flow modeling  
11 than contaminant fate and transport modeling?

12 MS. BAUGHMAN: Objection.  
13 Form.

14 THE WITNESS: In terms of my  
15 publications, yeah, I've -- my -- I've  
16 done more research on -- well, in the  
17 last ten years, the focus of my  
18 research has been more shifted to  
19 using earth observations and machine  
20 learning and data analytics to analyze  
21 aquifers.

22 MR. ANTONUCCI: I'd like to  
23 talk to you about that more later in  
24 the deposition. For now, it's been  
25 about an hour, would you like to take

1 a break?

2 THE WITNESS: Sure.

3 MR. ANTONUCCI: Okay.

4 MS. BAUGHMAN: If you're -- if  
5 you're willing to keep going, we can.  
6 We don't have to. That's up to you.

7 THE WITNESS: I can keep going.

8 MR. ANTONUCCI: Well, I'd like  
9 to take a break.

10 THE WITNESS: Sure. All right.

11 THE VIDEOGRAPHER: Off the  
12 record. The time is 10:18.

13 (There was a break taken.)

14 THE VIDEOGRAPHER: We're back  
15 on the record. The time is 10:28.  
16 This is Media Number 2.

17 Counsel may proceed.

18 MR. ANTONUCCI: All right. I  
19 am going to hand you what is being  
20 marked for identification as  
21 Exhibit 6.

22 (Exhibit 6 was marked for identification.)

23 MR. ANTONUCCI: Sorry, I just  
24 noticed my microphone wasn't on.

25 Q. I just handed you what was

1 marked for identification as Exhibit 6.

2 Dr. Jones, this is your initial  
3 expert report and materials considered;  
4 right?

5 A. Correct.

6 Q. And looking at that first page,  
7 the cover page, title is Tarawa Terrace Flow  
8 and Transport Model Post-Audit prepared for  
9 Bell Legal Group. A couple lines down,  
10 prepared by Norman L. Jones, R. Jeffrey  
11 Davis.

12 Is that your signature there?

13 A. Yes.

14 Q. Okay. How do you know  
15 Mr. Davis?

16 A. He was a former graduate  
17 student of mine when I was a young professor  
18 at Brigham Young University. And then I  
19 hired him to be a staff member in our  
20 research laboratory where we were developing  
21 groundwater modeling software.

22 And then I worked with him in  
23 that capacity for several years, and then  
24 even after he left the university I -- we  
25 worked together on consulting projects and

1 teaching groundwater and contaminant  
2 transport modeling short courses.

3 Q. So it's fair to say that you've  
4 worked together before your work on this  
5 case?

6 A. Yes.

7 Q. And it appears that you  
8 co-wrote this expert report; is that correct?

9 A. That's correct.

10 Q. Did you participate in the  
11 drafting process with Mr. Davis?

12 A. Drafting?

13 Q. I guess can you explain to me  
14 your -- your role in the preparation of this  
15 report.

16 A. Yes. We decided it would be  
17 beneficial to team up. I have certain  
18 limitations on my time given that I'm a  
19 full-time university professor, and we  
20 decided that we would work together, we could  
21 share the workload.

22 And so he did most of the  
23 modeling work in terms of entering the data  
24 into the GMS MODFLOW MT3DMS software and  
25 running the model simulations.

1 I did a lot of the  
2 post-processing and data analysis. Together  
3 we -- we reviewed the -- the data, reviewed  
4 the -- the prior publications from ATSDR, and  
5 then we -- together we drafted and edited and  
6 finalized this report.

7 This report also -- in the  
8 preparation of the report we utilized staff  
9 at Integral Consulting. For example, the --  
10 the figures with the maps. We provided the  
11 model results to staff members at Integral  
12 and they helped do a lot of the formatting.

13 There was also a professional  
14 copy editor that reviewed the documents  
15 before we submitted them.

16 Q. A moment ago you mentioned that  
17 Mr. Davis used GMS, which I believe  
18 incorporates MODFLOW and MT3DMS; is that  
19 right?

20 A. That's correct. It's what we  
21 call a pre and post processing for MODFLOW  
22 and MT3DMS. It -- the input files to MODFLOW  
23 and MT3DMS are very large and complicated and  
24 synthesize a lot of data. And so GMS was  
25 developed to streamline and simplify that

1 process and encapsulate it in what we call a  
2 graphical user interface.

3 It -- you can -- you can modify  
4 the input files through the GMS interface,  
5 for example, save the modified files, run --  
6 and then GMS will then launch MODFLOW and/or  
7 MT3D, and then they generate a set of output  
8 files which are ingested to GMS for -- for  
9 visualization plotting.

10 Q. And you and Mr. Davis developed  
11 GMS for the Department of Defense; is that  
12 right?

13 A. That's correct. We were -- it  
14 was developed, yeah, in the early part of my  
15 career.

16 Q. Okay. Turning your attention  
17 back to Exhibit 6, your initial report. And,  
18 by the way, if I refer to this --

19 A. Okay.

20 Q. -- as your initial report, will  
21 you understand what I'm saying?

22 A. Sure.

23 Q. Okay. Do you agree with all of  
24 the opinions and statements made in  
25 Exhibit 6?



1           A.       Yes.

2           Q.       And then I'd appreciate it if  
3 you could turn to the back, because I've  
4 appended your materials considered list.

5                    So is this a fair and accurate  
6 copy of your initial report and materials  
7 considered list?

8           A.       Yes.

9           Q.       Okay. Thank you, Dr. Jones.  
10 You can put that to the side.

11                   I'm now going to hand you what  
12 will be marked for identification as  
13 Exhibit 7.

14                   (Exhibit 7 was marked for identification.)

15                   MS. BOLTON: For the record, a  
16 revised copy of this materials list,  
17 it was served after this initial one.

18                   MR. ANTONUCCI: For the  
19 rebuttal report?

20                   MS. BOLTON: No. This is the  
21 October 2024 report, so for the  
22 initial report.

23                   MR. ANTONUCCI: Okay.

24                   MS. BAUGHMAN: Do you want us  
25 to send that to you so that you can

1 mark it or?

2 MS. BOLTON: Yeah, it includes  
3 all of those, plus additional.

4 MR. ANTONUCCI: That's right.  
5 Yes, if you could send it, that would  
6 be great.

7 MS. BOLTON: Okay.

8 Q. BY MR. ANTONUCCI: Okay.  
9 Dr. Jones, I showed you what's been marked  
10 for identification as Exhibit 7. This is a  
11 report titled "Rebuttal Report Regarding  
12 Tarawa Terrace Flow and Transport Model  
13 Post-Audit"; is that right?

14 A. That's correct.

15 Q. Is this the -- if I refer to  
16 this as your rebuttal report, will you  
17 understand that I'm referring to Exhibit 7?

18 A. Yes.

19 Q. Okay. And, again, it looks  
20 like it says "Prepared by Norman L. Jones"  
21 with your signature on the front page; is  
22 that right?

23 A. Yes.

24 Q. And, again, I appended the  
25 materials considered to the end of this

1 report.

2 A. Yes.

3 Q. Did you participate in the  
4 drafting of this report in the same way as  
5 with your initial report?

6 A. Yes.

7 Q. Were there any changes in how  
8 you and Mr. Davis divided labor?

9 A. No.

10 Q. So it's fair to say you  
11 undertook substantially the same process to  
12 draft both reports?

13 A. That's correct.

14 Q. Do you agree with all of the  
15 opinions made in Exhibit 7?

16 A. Yes.

17 Q. Do you hold every opinion in  
18 Exhibit 6, that's your initial report, as  
19 your own opinion?

20 A. Yes.

21 Q. Do you hold every opinion in  
22 Exhibit 7, your rebuttal report, as your own  
23 opinion?

24 A. Yes.

25 Q. Is there anything in either

1 report that you believe is incorrect or needs  
2 updating?

3 A. Well, there were some -- can  
4 you clarify what you mean by that? You mean  
5 in how it's written?

6 Q. I think you might be referring  
7 to the changes that were made to the  
8 post-audit --

9 A. Correct.

10 Q. -- in between the initial and  
11 rebuttal report; is that right?

12 A. Correct.

13 Q. So other than those changes, is  
14 there anything incorrect in either report?

15 A. Not that I can think of.

16 Q. Okay. Is there anything that  
17 needs to be updated in either report?

18 A. Not that I can think of.

19 Q. Is any portion of either report  
20 incomplete?

21 MS. BAUGHMAN: Objection.

22 Form.

23 THE WITNESS: Not that I can  
24 think of.

25 Q. BY MR. ANTONUCCI: Okay. So

1 Exhibit 6 and 7, your initial and rebuttal  
2 reports, do these include all of the opinions  
3 you hold regarding ATSDR's groundwater flow  
4 and transport models for Marine Corps Base  
5 Camp Lejeune?

6 MS. BAUGHMAN: Objection.

7 Form.

8 THE WITNESS: Can you clarify  
9 what you mean by that.

10 Q. BY MR. ANTONUCCI: Do you have  
11 any opinions on ATSDR's water modeling  
12 efforts at Camp Lejeune that are not  
13 contained in either Exhibit 6 or Exhibit 7?

14 MS. BAUGHMAN: Objection.

15 Form.

16 THE WITNESS: Yeah, I -- I'm  
17 not sure I'm comfortable saying I  
18 would never have any other opinions  
19 than what are contained here.

20 Q. BY MR. ANTONUCCI: Sure. In  
21 what sort of circumstances would -- would you  
22 have a new opinion?

23 MS. BAUGHMAN: Objection.

24 Form.

25 THE WITNESS: Well, if you were

1 to ask me about specific questions  
2 related to different parts of the  
3 modeling that's done in Chapter A and  
4 Chapter F by ATSDR, there may be  
5 specific opinions about that, which  
6 I'd be happy to share that it may not  
7 be 100 percent included in these  
8 reports.

9 Q. BY MR. ANTONUCCI: Do you  
10 intend to offer any opinions that are not in  
11 this case -- strike that.

12 Do you intend to offer any  
13 opinions in this case that are not contained  
14 in Exhibit 6 or Exhibit 7?

15 MS. BAUGHMAN: Objection.  
16 Form.

17 THE WITNESS: In the context of  
18 this deposition?

19 Q. BY MR. ANTONUCCI: I'm  
20 referring to the entire case.

21 Do you intend to offer any  
22 other opinions in this case that are not  
23 contained in either Exhibit 6 or Exhibit 7?

24 MS. BAUGHMAN: Objection.  
25 Form.

1 THE WITNESS: If requested by  
2 our legal team, I would be willing to  
3 provide additional opinions.

4 Q. BY MR. ANTONUCCI: As you sit  
5 here today, do you have any additional  
6 opinions about ATSDR's water modeling efforts  
7 at Camp Lejeune that are not contained in  
8 either Exhibit 6 or Exhibit 7?

9 MS. BAUGHMAN: Objection.  
10 Form.

11 THE WITNESS: Yes, there are  
12 things about their initial report that  
13 I -- I would be happy to proffer as  
14 opinions in this deposition that  
15 aren't necessarily contained in this  
16 report.

17 Q. BY MR. ANTONUCCI: Okay. Can  
18 you list those for me, please.

19 A. Well, what I'm saying is in the  
20 context of -- of this discussion, there may  
21 be specific features in the context of the  
22 Monte Carlo simulation, the -- the confidence  
23 interval, the calibration exercise that may  
24 not -- I'm uncomfortable saying every opinion  
25 I have is exclusively contained in this.

1           Q.       So -- so to be clear, then, the  
2 answer is no, all of your opinions are not  
3 contained in your reports?

4           MS. BAUGHMAN:   Objection.

5           Form.

6           THE WITNESS:   In the context of  
7 what I just described, yes.   I'm  
8 hesitant to say everything, all of my  
9 opinions are here, and then later be  
10 told I can't render an opinion on  
11 something because I was told all of my  
12 opinions are in here, if you catch my  
13 drift.

14          Q.       BY MR. ANTONUCCI:   Can you  
15 explain why all of your opinions aren't in  
16 your report?

17          A.       These reports had a specific  
18 purpose and we were asked to do a post-audit,  
19 and then report the results of that.   And  
20 then we were asked to respond specifically to  
21 a rebuttal to our post-audit offered by  
22 Mr. Spiliotopoulos.

23                 And we -- so the purpose of  
24 these documents, to my understanding, was  
25 very specific and focused.



1 Q. Dr. Jones, do you understand  
2 that you've been retained as an expert in  
3 this case?

4 A. Yes.

5 Q. Do you understand the Federal  
6 Rules of Civil Procedure require you to  
7 disclose a complete list of your opinions?

8 MS. BAUGHMAN: Objection.

9 Form.

10 THE WITNESS: I'm not aware of  
11 that rule.

12 Q. BY MR. ANTONUCCI: Can you  
13 provide me with a list of the opinions you  
14 have that are not contained in your reports?

15 A. I don't have a list, no.

16 Q. Can you name a single opinion  
17 you have that's not contained in your  
18 reports?

19 A. I -- I would -- I would have to  
20 think about that.

21 Q. Okay. We'll come back to this.

22 A. Okay.

23 Q. If you could, please turn to  
24 Page 6-1 of Exhibit 6, that's your initial  
25 report.

1 A. Sure.

2 Q. Page 6-1 of Exhibit 6 has the  
3 heading "Conclusions"; is that right?

4 A. Correct.

5 Q. And there's a list of five  
6 categories of conclusions on this page; is  
7 that right?

8 A. Correct.

9 Q. Is this a complete list of all  
10 the conclusions from your report?

11 MS. BAUGHMAN: Objection.

12 Form.

13 THE WITNESS: These are the  
14 conclusions from our report, yes.

15 Q. BY MR. ANTONUCCI: Are there  
16 any conclusions from your initial report,  
17 Exhibit 6, that are not contained in this  
18 list?

19 A. No.

20 Q. Am I correct in understanding  
21 that this is not a complete list of all the  
22 opinions you will render in this case?

23 A. It's a -- given the context of  
24 what we're asked to do, this is a complete  
25 list of the -- of the opinions relative to

1       this. And I've not been asked to formally  
2       submit any additional opinions at this time.

3               Q.       Okay. Does any part of this  
4       list need to be updated?

5               A.       Not --

6                       MS. BAUGHMAN: Other than with  
7       the rebuttal? I mean, I object to the  
8       form.

9                       THE WITNESS: No.

10              Q.       BY MR. ANTONUCCI: Okay. And  
11       now as we've already discussed, you've  
12       provided a rebuttal report which modified  
13       some of the conclusions from Exhibit 6; is  
14       that right?

15                     MS. BAUGHMAN: Object to the  
16       form.

17                     THE WITNESS: No, I don't  
18       believe it modified the conclusions of  
19       this report. I wouldn't state it that  
20       way.

21              Q.       BY MR. ANTONUCCI: Okay. There  
22       were errors in Exhibit 6 that you corrected  
23       in Exhibit 7; is that correct?

24              A.       That's correct.

25              Q.       Okay.

1           A.       But I don't think any of those  
2 errors were significant enough to change the  
3 opinions rendered in the initial report.

4           Q.       I understand.

5                    So aside from those errors,  
6 are -- is there anything else in Exhibit 6,  
7 your initial report, sitting here today that  
8 is incorrect?

9           A.       Not that I can think of.

10          Q.       Okay. All right. Now if you  
11 could please flip to Page 1-1 of Exhibit 7,  
12 that's the rebuttal report.

13          A.       Sure.

14          Q.       All right. Page 1-1 of  
15 Exhibit 7, your rebuttal report, has the  
16 heading "Summary of Opinions"; is that right?

17          A.       Correct.

18          Q.       And there's a list of six  
19 opinions on Page 1-1 of Exhibit 6; right?

20          A.       Correct.

21          Q.       Is this a complete list of all  
22 the opinions from your rebuttal report,  
23 Exhibit 7?

24                    MS. BAUGHMAN: Objection.

25                    Form.

1 THE WITNESS: Yes.

2 Q. BY MR. ANTONUCCI: Do you have  
3 any opinions regarding the content of ATSDR's  
4 groundwater modeling efforts at Camp Lejeune  
5 that are not contained in this list?

6 MS. BAUGHMAN: Objection.

7 Form. Asked and answered.

8 THE WITNESS: I don't think I  
9 have any opinions that are  
10 inconsistent with this list, no.

11 Q. BY MR. ANTONUCCI: All right.  
12 Now, this is from the rebuttal report which  
13 includes the corrections to your initial  
14 report; is that right?

15 A. Say that again.

16 Q. We're looking at your rebuttal  
17 report right now, and this --

18 A. Yes.

19 Q. -- report includes corrections  
20 to your initial report; is that right?

21 A. Correct.

22 Q. Does any part of this report  
23 need to be corrected?

24 A. Not that I can think of.

25 Q. Is any part of this report

1 incorrect?

2 A. Not that I can think of.

3 Q. Is there any part of this  
4 report that needs to be updated?

5 A. No.

6 Q. You provided, I believe, three  
7 lists of materials considered in this case;  
8 is that right?

9 A. What are you referring to?

10 Q. So my understanding is that you  
11 provided a list of materials considered with  
12 your initial report, then an updated list of  
13 materials considered with that same initial  
14 report, and finally a list of materials  
15 considered with your rebuttal report; is that  
16 correct?

17 A. That sounds correct.

18 Q. Okay. Does that materials  
19 considered list include all of the facts,  
20 data, and information you considered in  
21 rendering your opinions?

22 A. I believe so, yes.

23 Q. Did you review any facts, data,  
24 or information not listed on your materials  
25 considered lists in rendering these opinions?

1 A. Not that I recall.

2 Q. Okay. Did you review any  
3 academic texts when preparing these opinions?

4 MS. BAUGHMAN: Objection.

5 Form.

6 You mean other than what's on  
7 the lists?

8 Object to the form.

9 THE WITNESS: I don't recall.

10 Q. BY MR. ANTONUCCI: Are you not  
11 sure if there's an academic text you've  
12 referenced that aren't on your materials  
13 considered list --

14 MS. BAUGHMAN: Objection.

15 Q. BY MR. ANTONUCCI: -- or in  
16 your report?

17 A. I don't recall any other  
18 references specifically considered that were  
19 not cited in our report.

20 Q. Okay. Did you review any  
21 course books or peer-reviewed articles in  
22 rendering these opinions?

23 MS. BAUGHMAN: Object to the  
24 form.

25 You mean other than what's

1 already referenced?

2 THE WITNESS: I -- in the  
3 process of conducting the post-audit  
4 and writing the review, I cited -- I  
5 believe we cited all of the materials  
6 that were directly referenced as part  
7 of that process.

8 Now, were there other books and  
9 articles through my career that I've  
10 read that influenced this? Probably.  
11 Things we specifically cited in terms  
12 of writing this that were specifically  
13 relevant, I believe we cited those.

14 Q. BY MR. ANTONUCCI: Can you  
15 think of any books or articles you've read  
16 through the course of your career that may  
17 have influenced your opinions?

18 A. Oh, yeah, I would say I have  
19 34 years of experience in groundwater and  
20 contaminant transport modeling, and I've read  
21 countless articles and books that form my  
22 basis of knowledge and expertise in this  
23 area.

24 Q. Is there any that stand out?

25 A. Not particularly.



1 Q. Okay. Have you reviewed or  
2 otherwise considered any other expert reports  
3 in this case?

4 A. Related to the case? I -- I've  
5 reviewed the -- several other -- I've  
6 reviewed the expert reports by Morris Maslia,  
7 Mustafa Aral, Leonard Konikow, I believe  
8 Sabatini is his name, the professor at  
9 Oklahoma.

10 Those are the ones I recall off  
11 the top of my head. And then of course  
12 the -- the DOJ reports that were submitted.

13 Q. By "the DOJ reports that were  
14 submitted," are you referring to the expert  
15 report of Dr. Spiliotopoulos?

16 A. Correct.

17 Q. And the expert report of  
18 Dr. Remy Hennes?

19 A. Yes.

20 Q. And the expert report of  
21 Dr. Jay Brigham?

22 A. Yes.

23 Q. So you reviewed all three of  
24 those?

25 A. Yes.

1           Q.       You mentioned reviewing the  
2       expert report of Morris Maslia; is that  
3       correct?

4           A.       Yes.

5           Q.       Morris Maslia submitted two  
6       reports in this case. Did you review both of  
7       those?

8           A.       Yes.

9           Q.       Beginning with his initial  
10      report, that was the report disclosed  
11      October 25th of 2024. Do you agree with all  
12      of the opinions in Mr. Maslia's report?

13                   MS. BAUGHMAN: Object to the  
14      form.

15                   THE WITNESS: As far as I can  
16      recall.

17           Q.       BY MR. ANTONUCCI: And with  
18      regard to Mr. Maslia's rebuttal report, that  
19      was the report disclosed January 14th of  
20      2025. Do you agree with all of the opinions  
21      in that report?

22                   MS. BAUGHMAN: Objection.  
23      Form.

24                   THE WITNESS: Yes.

25           Q.       BY MR. ANTONUCCI: What's your

1 opinion of Mr. Maslia?

2 A. I think he's a -- a very  
3 competent and experienced expert in the field  
4 of groundwater flow and transport modeling.

5 Q. What's his reputation in the  
6 field of groundwater flow and transport  
7 modeling?

8 A. As far as I know, he's  
9 respected.

10 Q. Turning to the expert report of  
11 Dr. Mustafa Aral, October 25, 2024, do you  
12 agree with all of the opinions in that  
13 report?

14 MS. BAUGHMAN: Object. Form.

15 THE WITNESS: I believe so. I  
16 can't think of anything specific that  
17 I would disagree with.

18 Q. BY MR. ANTONUCCI: What's your  
19 opinion of Dr. Aral?

20 A. He's a very accomplished and  
21 widely respected expert in this field.

22 Q. And do you agree with all of  
23 the opinions in Dr. Sabatini's report?

24 MS. BAUGHMAN: Objection.

25 Form.

1 THE WITNESS: Yes.

2 Q. BY MR. ANTONUCCI: What is your  
3 opinion of Dr. Sabatini?

4 A. I don't know him very well.

5 Q. Do you know his reputation in  
6 the field of groundwater modeling?

7 A. Not independent of this  
8 project. I reviewed his resum? and his  
9 experience and it seems very impressive.

10 Q. And did you -- did you agree  
11 with the opinions stated in the expert report  
12 of Dr. -- Dr. Leonard Konikow?

13 MS. BAUGHMAN: Objection.  
14 Form.

15 THE WITNESS: Yes.

16 Q. BY MR. ANTONUCCI: And what's  
17 your opinion of Dr. Konikow?

18 A. Well, he's -- he's one of the  
19 most widely respected experts in groundwater  
20 modeling.

21 Q. Okay. So would you say he has  
22 a generally good reputation in the field of  
23 groundwater modeling?

24 A. He has an exceptional  
25 reputation.

1           Q.       Okay. I'd appreciate if you  
2       could turn back to Exhibit 7, and I'd like  
3       for you to look at the materials considered  
4       list that's at the end of Exhibit 7.

5           A.       Sure.

6           Q.       So I understand that there's a  
7       sort of intermediate materials considered  
8       list for your initial report. However, this  
9       is your rebuttal report; right?

10          A.       Correct.

11          Q.       Is this the final materials  
12       considered list for your rebuttal report?

13          A.       These are the materials that we  
14       cited specifically in writing the report.

15          Q.       Does it also include the  
16       materials you considered in review -- in  
17       rendering your opinions?

18          A.       No, not necessarily. For  
19       example, this -- this doesn't include the --  
20       the specific list at the back doesn't include  
21       the DOJ reports.

22          Q.       Okay. Other than the DOJ  
23       reports, are there any other materials you  
24       considered in rendering your opinion that's  
25       not included on this list?

1 A. Not that I can think of.

2 Q. Okay. So according to this  
3 list, you considered ATSDR's Tarawa Terrace  
4 Chapters A, F, and C; is that correct?

5 A. Correct.

6 Q. Did you review any other  
7 chapters of ATSDR's Tarawa Terrace reports?

8 A. I skimmed through some of the  
9 others, but not in the same detail that I  
10 read Chapters A, C, and F.

11 Q. Do you remember which others  
12 you skimmed?

13 A. I don't recall.

14 Q. Do you remember the subject  
15 matter of the other reports that you skimmed?

16 A. The -- I believe it may have  
17 included a more detailed dive into the  
18 uncertainty analysis, but I -- I can't -- I  
19 couldn't specifically tell you which one. I  
20 just know I looked through the others.

21 Q. Okay. You remember discussion  
22 of the uncertainty analysis in the other  
23 reports. Do you remember the subject matter  
24 of any others?

25 A. I'm not positive on that, but I

1 believe that's the topic of one of the  
2 others. I -- I couldn't specifically cite  
3 the topics of the others, yes.

4 Q. Did you review others or just  
5 the uncertainty analysis chapter?

6 A. Like I say, I believe I skimmed  
7 through all of them, but -- just to see what  
8 was there, but I -- I did not do a -- as  
9 thorough a reading of those chapters as I did  
10 of A, C, and F.

11 Q. Okay. So you didn't thoroughly  
12 review Chapter B: Geologic Framework of the  
13 Castle-Hayne Aquifer System; correct?

14 A. Correct.

15 Q. You did not thoroughly review  
16 Chapter E: Occurrence of Contaminants in  
17 Groundwater; is that right?

18 A. Correct.

19 Q. You didn't thoroughly review  
20 Chapter G: Simulation of Three-Dimensional  
21 Multispecies Multiphase Mass Transport of  
22 Tetrachloroethylene (PCE) and Associated  
23 Degradation Byproducts; is that right?

24 A. Correct.

25 Q. You didn't closely review

1 Chapter H: Effective Groundwater Pumping  
2 Schedule Variation on Arrival of  
3 Tetrachloroethylene (PCE) at Water Supply  
4 Wells and Water Treatment Plants; is that  
5 correct?

6 A. Correct.

7 Q. And you didn't thoroughly  
8 consider or thoroughly review Chapter I:  
9 Parameter Sensitivity, Uncertainty, and  
10 Variability Associated With Model Simulations  
11 of Groundwater Flow, Contaminant Fate and  
12 Transport, and Distribution of Drinking  
13 Water; is that right?

14 A. I -- I believe I may have read  
15 that a little more carefully than the others,  
16 but certainly not to the same depth of  
17 analysis as I did to the other chapters.

18 Also, Chapter A is kind of a  
19 comprehensive summary, as I understand it, of  
20 all of the work that was done, including what  
21 was put in those other chapters. And so I  
22 felt like I had a reasonably good exposure to  
23 the overall methods and processes that were  
24 used and then described in more detail in  
25 those chapters.



1 But for the purpose of the  
2 post-audit which we were hired to do,  
3 certainly the most important chapters would  
4 be A, C, and F.

5 Q. Why are A, C, and F the most  
6 important chapters for the post-audit you  
7 were hired to do?

8 A. Because A is a -- is a  
9 comprehensive summary, a detailed summary of  
10 the entire modeling project. It was very  
11 helpful in getting an overview of all of the  
12 work that was done.

13 Chapter C provided a very  
14 detailed description of the construction and  
15 calibration of the MODFLOW flow model.

16 And Chapter F was a very  
17 detailed description of the construction and  
18 calibration, uncertainty analysis associated  
19 with the contaminant transport model.

20 And we were asked to, in -- in  
21 conducting the post-audit, to -- to perform  
22 simulations using both the flow and transport  
23 model. So they were clearly the most  
24 relevant chapters for our work.

25 Q. So you weren't asked to review

1 all of the Tarawa Terrace chapters?

2 A. They were provided to us and,  
3 you know, we -- we were -- we quickly  
4 determined which chapters would be most  
5 relevant. And it's a matter of, you know,  
6 where you focus your time and effort.

7 Q. Were you provided with ATSDR's  
8 reports on their water modeling efforts at  
9 Hadnot Point and Holcomb Boulevard?

10 A. Yes.

11 Q. Did you review any of those?

12 A. Yes.

13 Q. Is there a particular reason  
14 none of them are on your materials considered  
15 list?

16 A. Because our primary focus was  
17 Tarawa Terrace in terms of the -- what we  
18 were asked to do with the -- with the  
19 post-audit.

20 Q. Did you perform as close of a  
21 reading on the Hadnot Point/Holcomb  
22 Boulevard chapters as you did with Tarawa  
23 Terrace Chapters A, C, and F?

24 A. I wouldn't say it was as  
25 equally careful because it was less relevant,

1 but I did, as I recall, read the entire  
2 report on the Hadnot Point/Holcomb Boulevard  
3 report --

4 Q. Did you --

5 A. -- just to be familiar with the  
6 overall project.

7 Q. And you said that you read  
8 those. Did you skim through them or did you  
9 read them carefully?

10 A. I read them completely.

11 Q. Is there a reason that you  
12 skimmed through the Tarawa Terrace reports  
13 but not the Hadnot Point reports?

14 MS. BAUGHMAN: Objection to  
15 form.

16 THE WITNESS: I read through  
17 the portions of the -- carefully the  
18 Tarawa Terrace reports that I felt  
19 were most critical for the work we  
20 were asked to do.

21 Q. BY MR. ANTONUCCI: What about  
22 the Hadnot Point reports was critical for  
23 your Tarawa Terrace post-audit?

24 A. I -- I wouldn't classify it as  
25 critical. I partially read that out of

1 interest. Curious to -- to kind of see and  
2 compare the work that was done there versus  
3 the work that was done at Tarawa Terrace.

4 Q. Do you have any opinions on the  
5 Hadnot Point or Holcomb Boulevard chapters  
6 that ATSDR published?

7 MS. BAUGHMAN: Objection.

8 Form.

9 THE WITNESS: A general opinion  
10 that the work that was done there  
11 seemed to be rigorous and followed  
12 what I would consider good -- good  
13 practices, sound practices.

14 Q. BY MR. ANTONUCCI: And -- I'm  
15 sorry, go ahead.

16 A. I can't think of anything more  
17 specific than that, I would say.

18 Q. What is that opinion based on?

19 A. Just my reading the document  
20 and my experience and the processes they  
21 appeared to follow.

22 Q. Do you have any other opinions  
23 about ATSDR's Hadnot Point/Holcomb Boulevard  
24 modeling efforts other than that they were  
25 rigorous and followed good practices?

1           A.       Not that I can think of at the  
2 moment.

3           Q.       So you provided a post-audit  
4 for the Tarawa Terrace models; is that right?

5           A.       Correct.

6           Q.       You did not provide a  
7 post-audit for the Hadnot Point/Holcomb  
8 Boulevard model; is that right?

9           A.       That's correct.

10          Q.       Why did you not provide a  
11 post-audit for Hadnot Point or Holcomb  
12 Boulevard?

13          A.       We were not asked to do so.

14          Q.       Okay. Have -- are you familiar  
15 with the text Modeling Groundwater Flow and  
16 Contaminant Transport by Jacob Bear and  
17 Alexander H.-D. Cheng?

18          A.       I've heard of it.

19          Q.       Have you ever reviewed it?

20          A.       Not carefully, no.

21          Q.       Do you have any opinion on the  
22 reputation of Dr. Bear or Dr. Cheng?

23          A.       I know Dr. Bear is a  
24 well-known, widely respected groundwater  
25 expert. I'm not as familiar with the other

1 author.

2 Q. Do you consider Modeling  
3 Groundwater Flow and Contaminant Transport to  
4 be a reliable authority in the field of  
5 groundwater modeling?

6 MS. BAUGHMAN: Objection.  
7 Form.

8 THE WITNESS: What do you mean  
9 by "authority"?

10 Q. BY MR. ANTONUCCI: How would  
11 you define "authority"?

12 MS. BAUGHMAN: Objection.  
13 Form. He's asked you to clarify your  
14 question.

15 THE WITNESS: I would just say  
16 it's a -- it's a book in the field of  
17 groundwater I'm familiar with, written  
18 by a well-known groundwater expert.

19 Q. BY MR. ANTONUCCI: Do you  
20 consider it to be a reliable book?

21 MS. BAUGHMAN: Objection.  
22 Form.

23 THE WITNESS: I -- like I say,  
24 I -- I don't -- I haven't read it. I  
25 may have skimmed it earlier in my

1 career, so I -- I don't -- I'm not  
2 comfortable rendering an opinion on  
3 the book.

4 Q. BY MR. ANTONUCCI: Okay. Are  
5 you familiar with the text Applied  
6 Groundwater Modeling Simulation of Flow and  
7 Advective Transport by Mary Anderson, William  
8 Woessner and Randall Hunt?

9 A. Yes.

10 Q. My understanding is that there  
11 are two editions of that text; is that right?

12 A. That's correct.

13 Q. 1992 and 2015?

14 A. Correct.

15 Q. Have you reviewed both editions  
16 of that text?

17 A. Yes.

18 Q. Did you consult that text in  
19 rendering the opinions in your reports?

20 A. Only in the basis that those  
21 texts, along with hundreds if not thousands  
22 of other documents, have formed my general  
23 background and expertise in groundwater  
24 modeling. Not -- not specifically to the  
25 point where I would feel it needs to be

1 cited, that I can recall.

2 Q. Sure. So you consider the  
3 Anderson, Woessner, and Hunt text to be a  
4 reliable authority in the field of  
5 groundwater modeling?

6 MS. BAUGHMAN: Objection.  
7 Form.

8 THE WITNESS: I believe it's  
9 a -- a -- a valuable and informative  
10 book in the area of groundwater  
11 modeling.

12 Q. BY MR. ANTONUCCI: What do you  
13 mean by "valuable and informative"?

14 A. Meaning it has useful content  
15 that is helpful in forming understanding of  
16 groundwater modeling principles.

17 Q. Okay. In your experience as a  
18 professor, have you ever used that text?

19 A. I teach a graduate course on  
20 groundwater modeling, and I believe there  
21 were times in the past where I listed  
22 Anderson, Woessner as a -- as an optional  
23 textbook that -- but I haven't used it as a  
24 required textbook ever.

25 Q. Okay.



1           A.           That I recall.

2           Q.           Would you make an optional  
3 text -- would you list an optional text on  
4 your syllabus if it -- you considered it  
5 unreliable?

6                       MS. BAUGHMAN:  Objection.  
7           Form.

8                       THE WITNESS:  I'm not sure what  
9 you mean by "unreliable."  I think  
10 it's a valuable and instructive book  
11 on the general concepts of groundwater  
12 modeling.

13          Q.           BY MR. ANTONUCCI:  Okay.  Other  
14 than listing it on your syllabus as an  
15 optional text for your students, have you  
16 used it in any other capacity as a professor?

17          A.           One of the things that --  
18 there's a -- early in the book there's, I  
19 believe, a chapter on the groundwater  
20 modeling process, talks about forming  
21 conceptual models or the different steps in a  
22 modeling project, and if I ever refer to that  
23 text I often reference that as a -- as a good  
24 overview of the groundwater modeling process  
25 in general.

1                   When I -- when I teach my  
2                   course, I present it in a similar fashion.

3                   Q.           Okay. And that's because it's  
4                   valuable, informative, and instructive;  
5                   right?

6                   MS. BAUGHMAN:   Objection.  
7                   Form.

8                   THE WITNESS:   It's -- it's an  
9                   instructive textbook, yes.

10                  Q.           BY MR. ANTONUCCI:   Is it  
11                  valuable?

12                  MS. BAUGHMAN:   Objection.  
13                  Form.

14                  THE WITNESS:   I'd consider it  
15                  valuable, yeah.

16                  Q.           BY MR. ANTONUCCI:   Is it  
17                  instructive?

18                  A.           It's instructive.

19                  MR. ANTONUCCI:   All right. I  
20                  am going to mark for identification  
21                  Exhibit 8.

22                  (Exhibit 8 was marked for identification.)

23                  Q.           BY MR. ANTONUCCI:   All right,  
24                  Dr. Jones, do you recognize this?

25                  A.           Yes, I do.

1 Q. What is it?

2 A. These are lecture notes used in  
3 my graduate course on a Groundwater Modeling  
4 CE 547.

5 Q. Okay. Did you create -- it  
6 looks like this is a PowerPoint presentation;  
7 is that right?

8 A. Correct.

9 Q. Did you create this yourself?

10 A. I did.

11 Q. Okay. And is this a fair and  
12 accurate copy of your lecture notes from your  
13 graduate course in groundwater modeling?

14 A. It appears to be, yes.

15 Q. Okay. I'd like for you to turn  
16 to Page 2 and Slide 3.

17 A. Yes.

18 Q. I think this might be what you  
19 were referencing earlier with regard to the  
20 model development protocol from Anderson and  
21 Woessner; is that correct?

22 A. Woessner.

23 Q. Excuse me. Thank you.

24 A. Yeah.

25 Q. So --

1           A.       Excuse me. Yes, this is  
2       precisely what I was discussing earlier.

3           Q.       Okay. So you use the Anderson  
4       and Woessner text to discuss the model  
5       development protocol; is that right?

6           A.       Yes.

7           Q.       Okay. Did you adapt this flow  
8       chart from the Anderson and Woessner --  
9       Woessner text?

10          A.       Yes.

11          Q.       Okay. And then sort of  
12       flipping through the other sections of this  
13       PowerPoint, it looks like you continue to use  
14       it throughout the lecture; is that right?

15          A.       Well, the purpose of this  
16       lecture is to provide an overview of the  
17       model development protocol, and so the  
18       different slides here are explaining each of  
19       the different steps involved in the model  
20       development process, and thus it relates to  
21       the different items on that -- on that flow  
22       diagram.

23          Q.       Is that a yes?

24          A.       Yes.

25          Q.       Okay. Are you familiar with

1 the text Guidelines for Evaluating  
2 Groundwater Flow Models by Thomas Reilly and  
3 Arlen Harbaugh?

4 A. I'm aware of that, yes.

5 Q. Do you consider that text to be  
6 a reliable authority in the field of  
7 groundwater modeling?

8 A. Again, I -- I --

9 MS. BAUGHMAN: Object to the  
10 form.

11 THE WITNESS: I think it's a  
12 helpful book.

13 Q. BY MR. ANTONUCCI: Okay. How  
14 about the text Calibration and Uncertainty  
15 Analysis For Complex Environmental Models by  
16 John Doherty; are you familiar with that?

17 A. Yes.

18 Q. And John Doherty is the  
19 individual who developed the PEST code; is  
20 that right?

21 A. That's correct.

22 Q. Do you consider Calibration  
23 Uncertainty Analysis For Complex  
24 Environmental Models to be a reliable  
25 authority in groundwater modeling?

1 MS. BAUGHMAN: Object to the  
2 form.

3 THE WITNESS: I think it's a --  
4 it's a good reference for calibration.

5 Q. BY MR. ANTONUCCI: Okay. And  
6 earlier you -- you mentioned working with  
7 Dr. Prabhaker Clement on a grant or some --  
8 the project at the University of Alabama; is  
9 that right?

10 A. That's correct.

11 Q. Dr. Clement is the principal  
12 investigator of that project?

13 A. That's correct.

14 Q. What's your opinion of  
15 Dr. Clement?

16 A. Dr. Clement and I have worked  
17 together professionally since the earliest  
18 days of my career. I consider him a very  
19 good researcher and also a close personal  
20 friend. And he and I are also currently  
21 co-investigators on a NOAA-funded research  
22 grant.

23 Q. All right. I'm going to sort  
24 of refocus attention on the ATSDR reports  
25 which you were asked to provide opinions

1 about.

2 That's correct, that you were  
3 asked to provide opinions on ATSDR's Tarawa  
4 Terrace reports; right?

5 MS. BAUGHMAN: Object to the  
6 form.

7 THE WITNESS: I'm not sure I  
8 would phrase it that way. We were  
9 asked to conduct a post-audit and  
10 render opinions relative to that  
11 post-audit, and -- and that  
12 involved -- I'm going to take that  
13 back.

14 Yes, we did render opinions on  
15 these reports.

16 Q. BY MR. ANTONUCCI: Okay. These  
17 reports deal with, at a very basic level,  
18 groundwater models; right?

19 A. What do you mean by "a very  
20 basic level"?

21 Q. I don't mean to say that the  
22 reports themselves are basic. I guess I  
23 should say, like, essentially they deal with  
24 groundwater models; is that correct?

25 A. That's correct.

1 Q. Okay. Groundwater models are  
2 simplified versions of reality; right?

3 A. That's correct.

4 Q. And we should never expect a  
5 groundwater model to perfectly reproduce  
6 subsurface conditions; is that correct?

7 MS. BAUGHMAN: Object to the  
8 form.

9 THE WITNESS: That's correct.  
10 I would not expect any model to  
11 perfectly replicate the real-world  
12 system that it is meant to simulate.

13 Q. BY MR. ANTONUCCI: Okay. If  
14 you could please turn your attention back to  
15 Exhibit 8. That's the PowerPoint.

16 A. Sure.

17 Q. I'd like you to turn to  
18 Slide 14.

19 A. Yes.

20 Q. Okay. There are two quotes on  
21 this slide; right?

22 A. Correct.

23 Q. The first one says "One of the  
24 most insidious and nefarious properties of  
25 scientific models is their tendency to take



1 over, and sometimes supplant, reality." That  
2 quote is attributed to Erwin Chargaff?

3 A. That's correct.

4 Q. Did I read that correctly?

5 A. Uh-huh.

6 Q. And that was quoted in J.J.  
7 Zuckerman, The Coming Renaissance of  
8 Descriptive Chemistry, Journal of Chemical  
9 Education in 1986?

10 THE REPORTER: In what year?

11 MR. ANTONUCCI: 1986.

12 Q. Is that correct?

13 A. Yes.

14 Q. The next quote on the page  
15 says, quote, "... all models are  
16 approximations. Essentially, all models are  
17 wrong, but some are useful." And that quote  
18 is attributed to George E.P. Box.

19 Did I read that correctly?

20 A. Correct.

21 Q. And that's from George E.P. Box  
22 and Norman R. Draper, Empirical  
23 Model-Building and Response Surfaces 2007; is  
24 that right?

25 A. Correct.

1           Q.       This is the last slide of your  
2     lecture.

3           A.       That's correct.

4           Q.       Why did you choose to end your  
5     lecture with these quotes?

6           A.       Because it's a -- it's a fun  
7     launching pad for a discussion in the class.  
8     I read these quotes and I ask the students,  
9     What do you think of these statements? If  
10    models are wrong, why are you taking this  
11    class?

12                   And that leads to a --  
13    typically to a very constructive discussion  
14    of what's kind of captured in Box's quote  
15    there that, yeah, you should never expect a  
16    model to be a perfect replication of reality;  
17    however, models are extremely valuable as  
18    an -- as an interpretive tool, a historical  
19    reconstruction tool, and in many cases  
20    they're the best and only tool we have.

21                   And so, again, it's meant to  
22    stimulate a discussion where I then talk  
23    about the benefits of modeling, I talk about  
24    all the different cases in -- in groundwater  
25    management and analysis where models are

1 critical.

2 Q. You agree that all models are  
3 approximations?

4 A. Yes.

5 Q. You agree that all models are  
6 wrong?

7 MS. BAUGHMAN: Object to the  
8 form.

9 THE WITNESS: Wrong in the  
10 sense that they're all simplifications  
11 of reality. That's the context of his  
12 statement here.

13 Q. BY MR. ANTONUCCI: So we can't  
14 expect a model to be a perfect representation  
15 of reality; right?

16 A. That's correct.

17 Q. You can put Exhibit 8 aside  
18 now.

19 So I understand that you were  
20 asked to provide a post-audit of ATSDR's  
21 Tarawa Terrace groundwater flow and transport  
22 model; is that correct?

23 A. Correct.

24 Q. Were you asked to do any other  
25 evaluation of ATSDR's Tarawa Terrace flow and

1 transport model?

2 MS. BAUGHMAN: Object to the  
3 form.

4 THE WITNESS: What do you mean  
5 by "evaluation"?

6 Q. BY MR. ANTONUCCI: Did you do  
7 anything -- strike that.

8 Were you asked to do anything  
9 other than the post-audit?

10 MS. BAUGHMAN: Object to the  
11 form.

12 THE WITNESS: Jeff and I were  
13 asked to perform some additional  
14 simulations using the models to --  
15 with respect to how the model output  
16 varies as a function of retardation  
17 factor.

18 The -- the beginning simulation  
19 time or the -- excuse me -- the --  
20 when the contaminants were released.  
21 And both of those, the results of that  
22 were included in Morris Maslia's  
23 rebuttal report.

24 In other words, we were asked  
25 to run the models and post process the

1 results and generate some of the  
2 graphics that Morris then relied on in  
3 his report, and then we were -- most  
4 recently we -- we did an analysis  
5 where we varied the reaction rate and  
6 determined how sensitive the model was  
7 to the reaction rate.

8 Q. BY MR. ANTONUCCI: Is reaction  
9 rate a synonym for biodegradation rate?

10 A. It includes the biodegradation  
11 rate, yeah.

12 Q. Are there other -- so is it  
13 correct that reaction rate and biodegradation  
14 rate are not the same thing?

15 A. In general, the -- the reaction  
16 rate can include any kind of decay of the  
17 contaminant. Most commonly that's a result  
18 of biodegradation.

19 But, you know, in the grand  
20 scope of transport modeling, for example, if  
21 you're simulating a radioactive contaminant  
22 then it would simulate the half-life and  
23 decay of the contaminant.

24 Q. So you performed a sensitivity  
25 analysis varying the --

1 A. The reaction --

2 Q. -- reaction rate; is that  
3 right?

4 A. Correct.

5 Q. You did not vary the  
6 biodegradation rate?

7 A. Well, the reaction rate is  
8 inclusive of the biodegradation rate in this  
9 case.

10 Q. Does it include anything else?

11 A. I -- I believe that's  
12 predominantly what it's meant to represent in  
13 this case.

14 Q. Okay. And when were you asked  
15 to perform that sensitivity analysis?

16 A. Couple of weeks ago, maybe.

17 Q. Was it more than a month ago?

18 A. No.

19 Q. Was that after you had  
20 disclosed your rebuttal report?

21 A. Yes.

22 Q. Other than the figures that you  
23 created for Mr. Maslia's rebuttal report and  
24 the sensitivity analysis that we've already  
25 discussed, were you asked to do any other

1 evaluation of ATSDR's Tarawa Terrace  
2 groundwater flow and transport model?

3 A. No.

4 Q. Did you review the data mining  
5 techniques that ATSDR employed to generate  
6 their groundwater flow and transport model?

7 MS. BAUGHMAN: Object to the  
8 form.

9 THE WITNESS: I recall reading  
10 about what Morris referred -- or what  
11 was referred to as the data mining  
12 process, but I'm not sure I could  
13 recall specific details.

14 Q. BY MR. ANTONUCCI: So is it  
15 fair to say you didn't thoroughly evaluate  
16 the data mining process that ATSDR undertook?

17 MS. BAUGHMAN: Object to the  
18 form.

19 THE WITNESS: I -- I reviewed  
20 what was in, I believe, Chapter A --  
21 A, C, and F.

22 Q. BY MR. ANTONUCCI: Okay. Did  
23 you review the conceptual model for the  
24 Tarawa Terrace groundwater flow and transport  
25 model that ATSDR created?

1 A. Yes.

2 Q. Can you describe that review,  
3 please.

4 A. Well, the -- the conceptual  
5 model was described in the Chapters A, C, and  
6 F, and I reviewed it as I -- in that context.

7 Q. Did you undertake any other  
8 review of the conceptual model, apart from  
9 your review of the reports?

10 A. No.

11 Q. Did you note any flaws in the  
12 conceptual model?

13 A. I don't recall anything that  
14 stood out to me as being flawed or a bad  
15 assumption, no.

16 Q. Okay. If you had noted any  
17 flaws, would you have included that in your  
18 report?

19 A. Depending on the magnitude of  
20 the flaw, I suppose, yes.

21 Q. How big would a flaw have to be  
22 to be included in your report?

23 A. Well, one of the opinions in  
24 our report was the -- the methods that they  
25 followed were sound and followed good



1 scientific and engineering practices and,  
2 yeah, I just -- I did not find anything  
3 that -- that I was -- would consider to be an  
4 error in their process.

5 Q. If you had noted a flaw in  
6 ATSDR's conceptual model, do you believe that  
7 recalibration of the models using the  
8 post-audit data would have yielded  
9 substantive changes in ATSDR's original  
10 results?

11 MS. BAUGHMAN: Object to the  
12 form. Incomplete hypothetical.

13 THE WITNESS: Can you say that  
14 again.

15 Q. BY MR. ANTONUCCI: Sure.  
16 Suppose you had noted a flaw in  
17 ATSDR's conceptual model. Do you believe  
18 that recalibration of the ATSDR models using  
19 your post-audit data would have yielded  
20 substantive changes in ATSDR's original  
21 results and conclusions?

22 MS. BAUGHMAN: Object to the  
23 form.

24 THE WITNESS: I think their  
25 conceptual model was -- was sound and

1           consistent with the hydrogeologic  
2           conditions at Tarawa Terrace, and I  
3           think the model was well calibrated.

4           Q.           BY MR. ANTONUCCI: Do you have  
5           any opinion about whether or not a --  
6           Mr. Maslia or Dr. Aral should have reran the  
7           model using your post-audit data?

8           A.           Yes.

9           Q.           What is that opinion?

10          A.          So the -- the objective of the  
11          post-audit was to take the original MODFLOW  
12          and MT3D models and evaluate the performance  
13          of the model with additional data which was  
14          not available to them at the time they built  
15          the model.

16                      And when they built the model,  
17          they had two sets of data. They had PCE --  
18          well, they had a large set of head and flow  
19          data that they used to build a  
20          well-calibrated flow model, which is the  
21          foundation of the transport model.

22                      To calibrate the transport  
23          model, they had a set of PCE concentrations,  
24          I believe there were 36 at -- at different  
25          points in time at monitoring well locations.

1 And then they had some concentrations of  
2 water at the water -- Tarawa Terrace water  
3 treatment plant.

4 The objective, as I understand  
5 it, the original study was to do historical  
6 reconstruction of the concentration of the  
7 water at the water treatment plant based on  
8 the -- the migration of the plume through the  
9 Tarawa Terrace aquifer.

10 And when they did their  
11 calibration, the -- if you look specifically  
12 at the PCE -- measured PCE -- observed PCE  
13 concentrations at the observation wells,  
14 there was a high bias for observed  
15 concentrations in the lower range, but where  
16 there was high, observed concentrations, the  
17 simulated concentrations matched quite  
18 closely.

19 That's significant because that  
20 means that in the center of the plume where  
21 the concentrations are the greatest, the  
22 model did a good job predicting the  
23 concentrations.

24 Now, that happens to correspond  
25 to Well TT-26, which as the model showed was

1 the primary contributor of contaminated water  
2 to the Tarawa Terrace water treatment plant.

3 After they did their initial  
4 calibration --

5 INTERCOM SYSTEM: Hi everyone.  
6 Trina and her dog are in her office.  
7 If you want to go over there and say  
8 hi to -- to the dog and also to Trina  
9 if you want, please head over there.  
10 Thank you.

11 THE WITNESS: The -- they --  
12 they -- the -- the model simulated  
13 concentrations at the water treatment  
14 plant matched the observed  
15 concentrations at the water treatment  
16 plant extremely well.

17 So when we did our post-audit  
18 work, we had an additional 318  
19 measured concentrations, observed  
20 concentrations. A much richer set  
21 that they didn't have in the original  
22 case.

23 So -- but what we didn't have  
24 is, you know, additional  
25 concentrations at the water treatment

1 plant, of course, because they stopped  
2 pumping due to the contamination.

3 So when we did our post-audit,  
4 we found that the -- if you look at  
5 the simulated versus observed  
6 concentrations from the extended  
7 simulation we constructed in the  
8 post-audit, there's a significant  
9 amount of variance in the observed  
10 concentrations.

11 And that variance caused  
12 some -- some high fluctuations in the  
13 area -- in the error. However, the  
14 errors seemed to be well balanced,  
15 meaning the model did a good job at  
16 simulating the primary trajectory of  
17 the plume.

18 In fact, if you look at the  
19 bias, the bias we got from the  
20 extended simulation with the  
21 additional data was -- was smaller  
22 than the bias they had with the  
23 initial concentrations at the  
24 observation wells, which I believe  
25 strengthens the evidence supporting

1 the accuracy of the additional model.

2 And, therefore, I -- there's no  
3 reason for me to believe, based on the  
4 results of the post-audit, that the  
5 initial model was wrong, especially  
6 when it comes to the concentrations at  
7 the water treatment plant.

8 It did an excellent job and  
9 there's nothing in the post-audit that  
10 would warrant, I believe, that would  
11 be strong evidence to say, hey,  
12 there's something wrong with the  
13 original model.

14 Q. BY MR. ANTONUCCI: Well, thank  
15 you, Dr. Jones, I appreciate that. But my  
16 question was whether they should have reran  
17 the model using the newly available data?

18 MS. BAUGHMAN: Object to the  
19 form. Asked and answered.

20 THE WITNESS: We did rerun the  
21 model. That's part of the -- that's  
22 what we did in the post-audit, is we  
23 ran the model.

24 Are you asking me if they  
25 should have recalibrated it or if they

1           should have rerun the model?

2           Q.       BY MR. ANTONUCCI:  Should they  
3       have recalibrate the model using newly  
4       available data?

5           A.       We -- well, before you  
6       recalibrate it, you would do an analysis  
7       precisely in the fashion that we did.  You  
8       would test the original model using the new  
9       data.

10                   And if in that process there  
11       was some evidence that there was a major flaw  
12       with the original model or that you would get  
13       significantly different answer, then that may  
14       warrant a reevaluation.  But we did not find  
15       any evidence to that.

16                   MR. ANTONUCCI:  Okay.  I'd like  
17       to clarify for the record.  In my  
18       previous question I used the term  
19       "they."  I was referring to Morris  
20       Maslia and Dr. Aral and their expert  
21       reports.

22                   All right.  I would -- I would  
23       like to discuss a new document, so I  
24       am going to mark for identification  
25       Exhibit 9.

1 (Exhibit 9 was marked for identification.)

2 Q. BY MR. ANTONUCCI: All right.  
3 Dr. Jones, Exhibit 9 is the document titled  
4 "Analyses of Groundwater Flow, Contaminant  
5 Fate and Transport, and Distribution of  
6 Drinking Water at Tarawa Terrace and  
7 Vicinity, U.S. Marine Corps Base Camp  
8 Lejeune, North Carolina: Historical  
9 Reconstruction and Present-Day Conditions  
10 Chapter A: Summary of Findings."

11 And for the record, this  
12 document has the Bates range beginning  
13 CLJA\_WATERMODELING\_09-0000615638 and ends  
14 with the Bates number ending in 615753.

15 And when I say "Bates number,"  
16 Dr. Jones, do you know what I'm referring to?

17 A. My understanding is it's a --  
18 it's a systematic way of referring to content  
19 that's been submitted in litigation.

20 Q. Right. It's the numbers at the  
21 bottom; right?

22 A. Right.

23 Q. Okay. So I would appreciate if  
24 you could turn to Page A48 of Exhibit 9, and  
25 that page ends in Bates Number 615699.



1                   Okay. So the caption  
2 underneath the figure on Page A48 says  
3 "Figure A21. Sensitivity of  
4 tetrachloroethylene concentration in finished  
5 water at the water treatment plant to  
6 variation in water-supply well operations,  
7 Tarawa Terrace, U.S. Marine Corps Base Camp  
8 Lejeune, North Carolina. [PCE,  
9 tetrachloroethylene; see text for discussion  
10 of points A-I]."

11                   You're familiar with this  
12 figure; right, Dr. Jones?

13           A.       Yeah, I've seen it before.

14           Q.       This is one of the figures you  
15 had tabbed in your copy of the report; right?

16           A.       No, it was not.

17           Q.       Okay. Well, this is a graph  
18 from ATSDR's sensitivity analysis of the  
19 Tarawa Terrace model; isn't that right?

20           A.       Correct.

21           Q.       And this shows the change in  
22 PCE concentrations in finished water based on  
23 different well pumping schedules; is that  
24 right?

25           A.       Correct.

1           Q.       And, Dr. Jones, you're aware  
2       that ATSDR used the pumping and schedule  
3       optimization system tool to simulate  
4       otherwise unknown supply well pumping rates;  
5       right?

6           A.       Yes.

7           Q.       And in this graph, all of the  
8       simulations assumed a constant mass loading  
9       rate of 1,200 grams per day; is that right?

10          A.       Yes, I assume so.

11          Q.       And that constant rate of  
12       1,200 grams per day is the same mass loading  
13       rate that you used when conducting the  
14       post-audit; right?

15          A.       Correct, we did not change the  
16       model.

17          Q.       Okay. So looking at Figure A21  
18       on Page A48 of Exhibit 9, we see that all of  
19       these use a mass loading start date of  
20       January 1953; is that correct?

21          A.       Where are you reading that?

22          Q.       Strike that.

23                 All of the -- ATSDR's model  
24       assumed a PCE mass loading start date of  
25       January 1953; is that right?

1           A.       As far as I know, yes.

2           Q.       Okay. And that's the same mass  
3 loading start date that you used in your  
4 post-audit?

5           A.       Correct.

6           Q.       Okay. So on Figure A21, that  
7 blue line that's -- it's labeled A.  
8                   Do you see that?

9           A.       Yes.

10          Q.       This blue line shows the  
11 earliest arrival of PCE at the water  
12 treatment plant under the maximum pumping  
13 schedule; right?

14          A.       Correct.

15          Q.       Okay. And so that blue line  
16 shows a concentration of 0.001 micrograms per  
17 liter of PCE starting just before  
18 January 1955; is that right?

19          A.       That looks correct, yes.

20          Q.       Okay. Now, there's also a red  
21 line here, and that one is labeled B.  
22                   Do you see that?

23          A.       Yes.

24          Q.       And that is the calibrated  
25 model; right?

1 A. Correct.

2 Q. Okay. That's the same -- that  
3 model used the same parameters that you used  
4 in your post-audit; is that right?

5 A. Yes.

6 Q. So that red line, the  
7 calibrated model, shows a concentration of  
8 0.001 micrograms per liter of PCE starting on  
9 or about January 1955; right?

10 A. Correct.

11 Q. Okay. Next I'd ask that you  
12 look at the black line. That one is labeled  
13 C.

14 A. Yes.

15 Q. So this shows the late arrival  
16 of PCE at the water treatment plant under the  
17 Minimum Schedule Number 2; is that right?

18 A. That looks correct.

19 Q. Okay. And under the Minimum  
20 Schedule 2, TT-26 is operated at at least  
21 25 percent capacity; right?

22 A. Yes.

23 Q. And that black line that's  
24 line -- letter C shows a concentration of  
25 0.001 micrograms per liter of PCE starting

1       sometime after January 1955; right?

2               A.       Yes.

3               Q.       All right. Now, finally  
4       there's the green line, and that one is, I  
5       believe, split into D and G.

6                       Do you see what I'm referring  
7       to?

8               A.       Yes -- well, let's see. The  
9       black -- oh, yes, the -- Well TT-26 not  
10      operated January '62 to February 1976, hence  
11      there's a gap, yes.

12              Q.       Okay. So that green line, that  
13      shows the arrival -- excuse me -- it shows  
14      the latest arrival of PCE at the water  
15      treatment plant under Minimum Schedule 1;  
16      right?

17              A.       That's -- that looks correct,  
18      yeah.

19              Q.       Okay. And minimum -- Minimum  
20      Schedule 1 is where Well TT-26 is not  
21      operated between January of 1962 and February  
22      of 1976?

23              A.       That's correct.

24              Q.       Okay. So that green line shows  
25      a concentration above 0.001 micrograms per

1 liter of PCE starting sometime between  
2 January 1955 and January of 1960; right?

3 A. Starting, yes.

4 Q. Okay. And then there's sort of  
5 a gap where the green line is not represented  
6 on the figure, and then it restarts again  
7 sometime between January 1970 and  
8 January 1975; is that right?

9 A. Yes.

10 Q. Okay. So in general, that blue  
11 line, that shows the highest PCE  
12 concentrations over time; right?

13 A. Yes.

14 Q. Then that red line there, that  
15 shows the next highest PCE concentrations  
16 over time; right?

17 A. Yes.

18 Q. Then the black line shows the  
19 next highest PCE concentrations over time?

20 A. Yeah, I think that's fair.

21 Q. Okay. And, finally, that green  
22 line shows the lowest PCE concentrations over  
23 time; right?

24 A. Correct.

25 Q. Okay. So the arrival of PCE at

1 the water treatment plant is dependent on  
2 when PCE contamination arrived at the supply  
3 wells; right?

4 A. Can you say that again.

5 Q. Of course.

6 The arrival of PCE at the water  
7 treatment plant is dependent on when PCE  
8 contamination arrived at the supply wells;  
9 right?

10 A. Correct.

11 Q. The concentration of PCE  
12 simulated by the model is dependent on when  
13 PCE contamination arrived at the supply  
14 wells; right?

15 A. The concentration at the  
16 treatment plant. You said -- I'm sorry, can  
17 you state that one more time.

18 Q. Of course.

19 The concentration of PCE  
20 simulated by the model is dependent on when  
21 PCE contamination arrived at the supply  
22 wells; right?

23 MS. BAUGHMAN: Object to the  
24 form.

25 THE WITNESS: Yeah, I -- I

1 think you're not clear in how you  
2 formulated that question. Do you mean  
3 the concentration at the water  
4 treatment plant?

5 Q. BY MR. ANTONUCCI: As opposed  
6 to?

7 A. You just said "the  
8 concentration."

9 Q. Sure. Yes. Let's say -- I'll  
10 rephrase the question.

11 A. Okay.

12 Q. The concentration of PCE  
13 simulated by the model at the water treatment  
14 plant is dependent on when PCE contamination  
15 arrived at the supply wells; right?

16 A. Correct.

17 Q. Okay. And to be clear, the  
18 contamination at the water treatment plant  
19 was assumed to be the same level at the tap  
20 in consumer's homes; right?

21 A. Would you state that again.

22 Q. Sure.

23 The ATSDR assumed that  
24 contaminations of PCE at the water treatment  
25 plant were the same as those after the water



1 had gone through the water distribution  
2 system and was at the point of use by the  
3 consumer; is that right?

4 A. Yeah, I'm not sure on that.

5 Q. Do you know if -- I mean,  
6 should there be a different contamination  
7 concentration at the water treatment plant  
8 versus at the tap?

9 A. I know that one of the areas  
10 that's been debated in the -- in the  
11 rebuttals and the expert report is how much  
12 the concentration changes through the water  
13 treatment process, and I know that was  
14 reviewed by the expert panel and others.

15 I'm generally familiar with  
16 that discussion that that volatilization  
17 issue was addressed by Sabatini. That is not  
18 my area of expertise.

19 I will say that what the model  
20 simulates is the water that would be pumped,  
21 the concentration of the water as it's pumped  
22 out of the aquifer, that's what -- the model  
23 does not inherently explicitly include the  
24 treatment process as part of the model.

25 Q. Okay.

1           A.       It's simply how the  
2       contaminants move through the aquifer through  
3       the wells.

4           Q.       Do you agree that there would  
5       be losses of contamination to volatilization  
6       during the treatment process?

7                   MS. BAUGHMAN:   Object to the  
8       form.

9                   THE WITNESS:   That is not my  
10       area of expertise.

11          Q.       BY MR. ANTONUCCI:   Okay.  
12       However, the model -- the model doesn't take  
13       that into account --

14                  MS. BAUGHMAN:   Object to the  
15       form.

16          Q.       BY MR. ANTONUCCI:   -- correct?

17          A.       The model does not explicitly  
18       simulate volatilization.

19          Q.       Does the model implicitly  
20       simulate volatilization?

21          A.       It potentially could.

22          Q.       Can you please elaborate.

23          A.       Sure.   Suppose that the  
24       concentrations used to calibrate the model  
25       were concentrations taken from treated water.

1 If the model is then calibrated to predict  
2 accurate concentrations at the water  
3 treatment plant based on observed  
4 concentrations of treated water, then you  
5 could argue that it implicitly includes the  
6 effects of any volatilization.

7 Q. Did the model calibrate to  
8 treated water samples?

9 A. I know some of the samples --  
10 from what I've read, it's believed some of  
11 the samples may have been post-treated water,  
12 and -- but I don't know if there's any  
13 conclusion on the majority of the samples.

14 Q. Okay. Well, it's fair to say  
15 that concentrations of PCE at the water  
16 treatment plant that's simulated by the model  
17 is dependent on when PCE contamination began  
18 entering the aquifer; right?

19 A. Yeah.

20 Q. Based on your review of the  
21 reports, is it your understanding that ATSDR  
22 assumed PCE contaminants started leaking when  
23 ABC Cleaner started operating in 1953?

24 A. Yes.

25 Q. Hypothetically, if ABC Cleaners

1 opened later than 1953, would that impact the  
2 arrival time of contaminants at the water  
3 treatment well?

4 A. It would --

5 MS. BAUGHMAN: Object to the  
6 form. Incomplete hypothetical.  
7 Go ahead.

8 THE WITNESS: It makes a small  
9 difference in the concentrations at  
10 the water treatment plant.

11 Q. BY MR. ANTONUCCI: Okay. So  
12 let's say that the --

13 MS. BAUGHMAN: Were you  
14 finished answering?

15 THE WITNESS: Let me clarify.  
16 I know some different dates  
17 have been proposed, argued by the DOJ  
18 experts as a more accurate start date.

19 Having run the model at both  
20 start dates, I -- I believe that the  
21 differing start dates as proposed by  
22 the DOJ experts does not make a  
23 substantial difference in the  
24 concentrations that are simulated at  
25 the water treatment plant.

1 Q. BY MR. ANTONUCCI: Okay. So it  
2 doesn't make a substantial difference; right?

3 A. No, that was part of Morris  
4 Maslia's rebuttal report.

5 Q. Is that a yes?

6 A. Yes.

7 Q. Okay. Does it make any  
8 difference?

9 A. It makes some difference.

10 Q. Okay. Hypothetically, let's  
11 ignore the start dates proposed by differing  
12 experts.

13 A. Okay.

14 Q. Let's say that the  
15 contamination began in 1970. How big of a  
16 difference would that make?

17 MS. BAUGHMAN: Object to the  
18 form.

19 THE WITNESS: If the  
20 contamination started in 1970 --

21 Q. BY MR. ANTONUCCI: Let's say --  
22 what would the impact on 1981 data be?

23 MS. BAUGHMAN: Object to the  
24 form. Are you asking in terms --  
25 wait, in 1981?

1                   Are you asking in terms of the  
2                   concentration or the arrival time? I  
3                   object to the form. I don't  
4                   understand the question.

5                   THE WITNESS: So if --

6                   MS. BAUGHMAN: It's also  
7                   outside the scope.

8                   THE WITNESS: If the  
9                   contamination was not released until  
10                  1970, and that was simulated in the  
11                  model, yeah, I would suspect that  
12                  would lead to a much more significant  
13                  difference in the results.

14                 Q.           BY MR. ANTONUCCI: Okay. If  
15                 you were to -- to dispose of dry cleaning  
16                 solvents improperly -- which I know you never  
17                 would -- they would be -- you would -- let's  
18                 assume you would dump them on the ground.

19                               Do you understand where my  
20                 hypothetical is so far?

21                 A.           Okay, yeah, sure.

22                 Q.           If you were to just pour dry  
23                 cleaning solvents on the ground outside,  
24                 would the PCE from that solvent enter the  
25                 aquifer immediately?

1 MS. BAUGHMAN: Object to the  
2 form. Incomplete hypothetical.  
3 Foundation.

4 THE WITNESS: Immediately, no.

5 Q. BY MR. ANTONUCCI: Okay. Can  
6 you elaborate?

7 A. Well, if you -- for example, if  
8 you had a really high water table, the water  
9 table's close to the surface, it would enter  
10 it very rapidly. Or if you had highly  
11 permeable materials between the ground  
12 surface and the aquifer, that contamination,  
13 again, could happen very rapidly, so it's --  
14 depends on the context.

15 Q. Sure. I guess is the inverse  
16 true? If you had a low water table or low  
17 permeability materials?

18 MS. BAUGHMAN: Object to the  
19 form.

20 THE WITNESS: There are  
21 conditions where it would take longer  
22 to get to the groundwater, yes, if  
23 it's starting at the ground surface.

24 Q. BY MR. ANTONUCCI: Okay. So  
25 from the ground surface to the aquifer it has

1 to travel through something; right?

2 A. Yeah.

3 Q. And that takes time, depending  
4 on different conditions; right?

5 A. Yeah, another factor is the  
6 precipitation. How -- and snow melt,  
7 precipitation, how much water is -- is  
8 traveling through -- we call that the vadose  
9 zone between the ground surface and the water  
10 table.

11 And, you know, there are  
12 conditions that are a variety of conditions  
13 that would impact the -- the -- the rate of  
14 transport from the ground surface to the  
15 aquifer.

16 Q. Okay. Does MT3DMS model  
17 contaminant transport through the vadose  
18 zone?

19 A. No.

20 Q. Does TechFlowMP?

21 A. I believe it does, yes.

22 Q. And then for my own  
23 understanding, the vadose zone and the  
24 unsaturated zone, are those the same concept?

25 A. Yeah, same thing.



1           Q.       If -- if the DOJ experts are  
2       correct, would you agree that it makes a  
3       substantial difference for calculating  
4       exposure to someone at Tarawa Terrace prior  
5       to DOJ's start but after ATSDR's mass loading  
6       start?

7                   MS. BAUGHMAN:   Object to the  
8       form.

9                   THE WITNESS:    I don't  
10       understand the question.

11           Q.       BY MR. ANTONUCCI:   Not sure I  
12       do either.

13                   So say the true start date of  
14       contaminant mass loading at Tarawa Terrace is  
15       sometime between when ATSDR said it started  
16       and when DOJ said it started.

17                   You on board?

18           A.       So January '53 is when ATSDR  
19       said it started. To my understanding the DOJ  
20       said maybe June '54 or July '54? Does that  
21       sound right?

22           Q.       Sounds about right.

23           A.       Okay.

24           Q.       Sometime in between there.

25           A.       Okay.

1           Q.           If that was when mass loading  
2 started, would it make a substantial  
3 difference for calculating exposure for  
4 someone who was at Tarawa Terrace?

5           MS. BAUGHMAN: Object to the  
6 form.

7           THE WITNESS: Your question is  
8 not -- you said "if that is when." We  
9 just talked about two different dates  
10 or -- can you restate the question?

11          Q.           BY MR. ANTONUCCI: Sure.

12                       Let's say contaminant mass  
13 loading started in December 1953. Would --

14          A.           One year later, roughly, yeah.

15          Q.           Would that make a substantial  
16 difference for calculating exposure to  
17 someone at Tarawa Terrace?

18          MS. BAUGHMAN: Object to the  
19 form.

20                       THE WITNESS: No, I think one  
21 of the dates that we simulated may  
22 have been January 1954, which is one  
23 month off from that, and kind of  
24 between the January '53 and July '54  
25 dates and, no, none of those changes

1           in the date made a substantial  
2           difference in the concentration of the  
3           water at Well TT-26 or in the  
4           concentration of the water at the  
5           Tarawa Terrace water treatment plant  
6           over the majority of the time frame.

7           Q.           BY MR. ANTONUCCI:   Okay.   How  
8           far apart were the simulated concentrations  
9           from this experiment that you did for  
10          Mr. Maslia's report?

11                   MS. BAUGHMAN:   Object to the  
12           form.

13                   THE WITNESS:   Well, if -- if  
14           you have the copy of the Maslia  
15           rebuttal I could -- we could look at  
16           the graph.

17                   MR. ANTONUCCI:   Okay.

18                   THE WITNESS:   It -- in my  
19           opinion, there -- there was a minor  
20           difference through a majority of the  
21           simulation period.

22           Q.           BY MR. ANTONUCCI:   Were there  
23           major differences at any time in the  
24           simulation period?

25                   MS. BAUGHMAN:   Object to the

1 form.

2 THE WITNESS: Not that I would  
3 consider significant. There was -- if  
4 you -- during the very early years,  
5 there was maybe a larger gap between  
6 the curves, but that is where the  
7 concentrations are really low.

8 And once the -- you get a few  
9 years later where the concentrations  
10 are higher, those curves -- the  
11 distance between those curves narrowed  
12 significantly and through most of the  
13 period from, you know, '60s, '70s,  
14 through the '80s, there's very little  
15 difference.

16 Q. BY MR. ANTONUCCI: Do you  
17 recall the magnitude of the difference at any  
18 time?

19 MS. BAUGHMAN: Object to the  
20 form.

21 THE WITNESS: Numerical  
22 magnitude, no.

23 Q. BY MR. ANTONUCCI: What  
24 numerical magnitude would you consider  
25 significant?

1 MS. BAUGHMAN: Object to the  
2 form.

3 THE WITNESS: That depends on  
4 the context.

5 Q. BY MR. ANTONUCCI: What -- what  
6 numerical difference would you consider  
7 minor?

8 A. Depends on the context.

9 Q. What would impact your  
10 consideration there?

11 A. Well, for example, in this case  
12 for the majority of the range the -- the  
13 concentrations are at a very high rate well  
14 over the MCL level of five.

15 And qualitatively looking at  
16 that, it seemed like the model was highly  
17 insensitive or relatively insensitive to  
18 the -- to the start date given the start  
19 dates that were considered.

20 Q. Okay. And earlier you  
21 mentioned that the model is perhaps better at  
22 calculating concentrations at TT-26 than over  
23 the wider area. Am I -- is that correct?

24 MS. BAUGHMAN: Object to the  
25 form.

1 THE WITNESS: That's not how I  
2 would characterize what I said.

3 Q. BY MR. ANTONUCCI: Can you  
4 please repeat it for me.

5 A. Sure.

6 MS. BAUGHMAN: Object to the  
7 form.

8 What's the question? I  
9 don't -- let's make sure there's a  
10 question.

11 THE WITNESS: Do you want me to  
12 restate what I said earlier relative  
13 to simulated concentrations at  
14 observation wells versus -- sure.

15 As I mentioned earlier, I  
16 believe the concentration data used to  
17 calibrate and evaluate the performance  
18 of the original flow and transport  
19 model consisted of two types of data.

20 One of which was PCE  
21 concentrations that were sampled at  
22 observation wells; and the other is  
23 a -- was a series of measured  
24 concentrations at the water treatment  
25 plant.

1                   When you have an individual  
2                   sample taken at an observation well,  
3                   it's a small amount of water from a  
4                   very small part of the aquifer, a  
5                   specific point location, and -- and it  
6                   has -- it's more susceptible to  
7                   sampling errors and -- and the impact  
8                   of local scale heterogeneities.

9                   And when they -- when they  
10                  calibrated to that, they had a good  
11                  match where the simulated observed  
12                  concentrations were high, and a bias  
13                  where the observed concentrations were  
14                  low.

15                 The concentrations that were  
16                 measured -- or that were observed at  
17                 the water treatment plant are  
18                 different because that involves the  
19                 collection of water from a variety of  
20                 wells over a period of time, and the  
21                 water pumped through those wells comes  
22                 from a -- a much broader part of the  
23                 aquifer than when you take a simple  
24                 sample.

25                 And those -- the contaminant is

1           then brought in and it's mixed and  
2           averaged. And so it has much less  
3           variation and sampling error than  
4           you'd get with the individual error.

5           So I would consider that to be,  
6           I would say, the gold standard of --  
7           of data for calibrating the original  
8           model. And it matched, in my opinion,  
9           the model-simulated results matched  
10          those observed concentrations at the  
11          water treatment plant quite well.

12          Q.           BY MR. ANTONUCCI: Okay.

13          Before this deposition began, when speaking  
14          to counsel, you used the phrase "dilution is  
15          the solution to pollution"; right?

16          A.           Yeah.

17          Q.           That's kind of what we're  
18          talking about here, isn't it?

19                       MS. BAUGHMAN: Object to the  
20          form.

21          Q.           BY MR. ANTONUCCI: There were  
22          multiple wells, some were presumably pumping  
23          clean water, some were presumably pumping  
24          contaminated water, mixing and diluting at  
25          the water treatment plant; right?



1 MS. BAUGHMAN: Object to the  
2 form.

3 THE WITNESS: Yeah -- well, the  
4 context are a little different. We  
5 were talking about dirty air being  
6 blown out of the valley.

7 But when you calculate the --  
8 the concentration of water at the  
9 water treatment plant, you have to  
10 consider the -- the pumping rate for  
11 each of the supply wells to the water  
12 treatment plant, and then the  
13 concentration of the water coming in.

14 So there's a mixing process  
15 that's represented in the equation we  
16 use to come up with those  
17 concentrations.

18 It weights the -- the overall  
19 concentration by the product of the  
20 individual concentrations and the  
21 individual pumping rates.

22 So there's a mixing and, yeah,  
23 there's a dilution process. For  
24 example, the -- the water coming in in  
25 Well TT-26 has a higher concentration

1           than the water you measure at the  
2           water treatment plant because it's  
3           mixed with water from other supply  
4           wells that have generally a lower  
5           concentration.

6           Q.           BY MR. ANTONUCCI:   Okay.   So --  
7           all right.   Thank you for answering that.

8                       If you could turn to Page A2 of  
9           Exhibit 9.   I think this will maybe tie up  
10          what we were discussing earlier.   And that is  
11          the page ending in Bates Number 615653.

12                      So the footnote on this page,  
13          Footnote 6 says "For this study, finished  
14          drinking water is defined as groundwater that  
15          has undergone treatment at a water treatment  
16          plant and is delivered to a person's home.  
17          The concentration of contaminants in treated  
18          water at the water treatment plant is  
19          considered the same as the concentrations in  
20          the water delivered to a person's home.   This  
21          assumption is tested and verified in the  
22          Chapter J report (Sautner et al. in press  
23          2007).   Hereinafter, the term 'finished  
24          water' will be used."

25                      Did I read that correctly?

1 A. Yes.

2 Q. So I will represent to you that  
3 Chapter J was never published. However, a  
4 draft of Chapter J was produced in this  
5 litigation with the Bates Number  
6 CLJA\_WATERMODELING\_05-22 -- excuse me --  
7 212246 through 212309.

8 Have you reviewed the draft of  
9 Chapter J?

10 A. No.

11 Q. Do you know whether any testing  
12 was done to compare the concentrations of  
13 contaminants delivered to the water treatment  
14 system with the concentrations of  
15 contaminants delivered to a person's home?

16 A. Not that I'm aware of.

17 Q. Okay. Please turn to Page A13  
18 of Exhibit 9. That's the page ending in  
19 Bates Number 615664.

20 A. Got it.

21 Q. Okay. So there's a sort of  
22 list of paragraphs on this page. One of them  
23 starts with the Number 4.

24 Do you see that?

25 A. Yes.

1           Q.       So this says "The monthly  
2       concentrations of PCE assigned to finished  
3       water at the Tarawa Terrace WTP were  
4       determined using a materials mass balance  
5       model (simple mixing) to compute the  
6       flow-weighted average concentration of PCE.  
7       The model is based on the principles of  
8       continuity and conservation of mass (Masters  
9       1998).

10                   Did I read that correctly?

11           A.       Yes.

12           Q.       Do you know what a materials  
13       mass balance model is?

14           A.       I know what they're describing  
15       here, yes.

16           Q.       So you agree that simple mixing  
17       flow-weighted average has no calculation  
18       simulating processes where contaminants are  
19       lost during storage, treatment, or  
20       distribution?

21           A.       That's correct. It's simply  
22       taking the -- the pumping rates and  
23       concentrations of the supply wells to  
24       determine what the resulting concentration of  
25       the mixed water would be at the water

1 treatment plant.

2 Q. So a simple mixing  
3 flow-weighted average wouldn't explicitly  
4 take into account something like sorption or  
5 volatilization?

6 MS. BAUGHMAN: Object to the  
7 form.

8 THE WITNESS: That's not what  
9 it's meant to do, no.

10 Q. BY MR. ANTONUCCI: It's true  
11 that ATSDR's Tarawa Terrace model did not  
12 include a calculation simulating contaminant  
13 losses during storage, treatment, or  
14 distribution; right?

15 A. Not that I'm aware of.

16 Q. You agree that ATSDR's Tarawa  
17 Terrace model simulated PCE concentrations as  
18 equivalent to the mixture of water straight  
19 out of the wells?

20 A. Yes.

21 Q. And ATSDR assumed continuity  
22 and conservation of mass in its simple mixing  
23 model; right?

24 A. Yes.

25 Q. Do you agree that some losses

1 during treatment, storage, and distribution  
2 are inevitable?

3 MS. BAUGHMAN: Object to the  
4 form. Outside the scope.

5 THE WITNESS: That is not my  
6 area of expertise. I don't have an  
7 opinion on that.

8 MR. ANTONUCCI: Okay. I'd like  
9 to break for lunch now.

10 THE WITNESS: Great.

11 THE VIDEOGRAPHER: We're off  
12 the record. The time is 12:10.  
13 (The lunch break was taken from  
14 12:10 p.m. until 1:13 p.m.)

15 THE VIDEOGRAPHER: We're back  
16 on the record. The time is 1:13.  
17 This is Media Number 3.

18 Counsel may proceed.

19 Q. BY MR. ANTONUCCI: All right.  
20 Dr. Jones, I remind you that you are still  
21 under oath.

22 Have you discussed the  
23 substance of your testimony with anyone  
24 during the break?

25 A. Only superficially.

1           Q.       Can you describe what you mean  
2 by that, please.

3           A.       Hey, Norm, you're doing a good  
4 job.

5           Q.       Okay. Did you discuss it --  
6 did you discuss it any further?

7           A.       No.

8           Q.       All right. A couple of things  
9 I want to circle back on from before the  
10 break. First is going to be this document,  
11 which I will mark as Exhibit 10.

12       (Exhibit 10 was marked for identification.)

13           THE WITNESS: Okay.

14           Q.       BY MR. ANTONUCCI: All right.  
15 Dr. Jones, do you know what this is?

16           A.       Yes.

17           Q.       What is it?

18           A.       It appears to be the model  
19 simulation results based on varying the  
20 reaction coefficient over three different  
21 values, and it shows the resulting  
22 concentrations at the water treatment plant  
23 and at Well TT-26.

24           Q.       Okay. What are the three  
25 different values that you used to perform

1       this analysis?

2               A.       One of which was the -- the --  
3       the middle line. The red line is the .005,  
4       which was what was used in the original ATSDR  
5       model. And one of those, as I understand,  
6       was a .004 value that was suggested or used  
7       by Faye. And then another one was a .006  
8       value, which was suggested by -- by Dr. Aral.

9               Q.       Okay. And for all of those  
10       values, those are different values of  
11       reaction rates; is that right?

12              A.       Yeah, so the only thing that  
13       was changed in the model was the reaction  
14       rate, and then we looked at what impact that  
15       had on the simulated concentrations for these  
16       two outputs.

17              Q.       Okay. And when did you perform  
18       this analysis?

19              A.       A week or two ago.

20              Q.       Okay. So there are two graphs  
21       here. I want to make sure we're looking at  
22       the same one. There's one that has a caption  
23       that says "MT3DMS," "Calibrated," and  
24       "TechFlowMP" in the top right. Then there's  
25       one that has the sort of legend in the middle



1 of the page; is that right?

2 A. Top left, yeah.

3 Q. Excuse me, thank you.

4 A. Yep.

5 Q. So what you just described, was  
6 that the version of the document with the  
7 legend in the center of the page or the left?

8 A. So the one with the legend in  
9 the center is the simulated concentrations at  
10 the Tarawa Terrace water treatment plant, and  
11 the one with the legend in the upper left  
12 corner is the simulated concentrations at  
13 Well TT-26.

14 Q. Understood.

15 And are the reaction rates the  
16 same for the different categories in both  
17 graphs?

18 A. Yes. Yeah, they're both based  
19 on the same model results, yeah.

20 Q. And then you also in front of  
21 you should have a series of spreadsheets.

22 Do you see those?

23 A. Yes.

24 Q. What -- what do these show?

25 A. So the first column are the

1 monthly dates through the simulation period,  
2 and then for each month the second column  
3 would be the -- the concentrations at --  
4 resulting from -- well, let me back up a  
5 little bit.

6 This -- I believe this  
7 spreadsheet represents the concentrations at  
8 the water treatment plant.

9 Q. Dr. Jones, when you say "this  
10 spreadsheet," are you referring to the one  
11 with the Bates number ending in 302 or  
12 document name ending in 302 up at the top?

13 A. 299.

14 Q. 299, okay.

15 All right. I'm on the Page 1  
16 of the spreadsheet with the title  
17 CL\_PLJ-EXPERT\_DAVIS\_0000000299.xlsx. Is that  
18 where you are?

19 A. Yes.

20 Q. And this is what you were  
21 describing in your last answer?

22 A. Yeah, so the first column or  
23 the simulated concentrations resulting  
24 from -- or excuse me -- the first column  
25 after the date it says r00004\_orig, that

1 would be the concentrations resulting from  
2 the simulation featuring a reaction rate of  
3 .004.

4 Likewise, the next column would  
5 be the results featuring a reaction rate  
6 labeled as -- or corresponding to .0005. And  
7 the last column would be the results with a  
8 simulation with a reaction rate of .0006.

9 In other words, it's the actual  
10 numbers used to generate the plots.

11 Q. Okay. I will ask you to take a  
12 look through CL\_PLJ-PLG-EXPERT\_DAVIS\_299 and  
13 ask if you're familiar with the data  
14 contained in this spreadsheet?

15 A. Yes, I am. I generated it.

16 Q. Okay. I'm interested in the  
17 difference between the values in the three  
18 columns, the Robert Faye column, the ATSDR  
19 column, and the Dr. Aral column.

20 If I refer to them that way, do  
21 you understand what I mean?

22 A. Yeah.

23 Q. Okay. What -- where is the  
24 smallest discrepancy between the three data  
25 points? At what time?

1           A.       The beginning.

2           Q.       Okay. Is that because they all  
3 simulate a concentration of 0 micrograms per  
4 liter?

5           A.       That's partly why.

6           Q.       Okay. Where is the largest  
7 discrepancy between any two columns on this  
8 spreadsheet?

9           A.       On the spreadsheet, I -- I'm  
10 not sure. If I had the spreadsheet in front  
11 of me I could use an Excel function to find  
12 that, but looking at the graphs, it appears  
13 that the -- the -- the spread between the  
14 curves increases until roughly late '60s and  
15 then it stays relatively constant after that  
16 in terms of the log-log plot.

17                   Overall, they're -- in my  
18 opinion, they're really close. In terms of a  
19 model result, this is what I would call the  
20 models being highly insensitive to changes in  
21 the reaction rate.

22           Q.       Did you just use the phrase  
23 "log-log plot"?

24           A.       A log plot. So that means the  
25 vertical axis is based on the log of the

1 concentrations.

2 Q. Okay. And both of these graphs  
3 use a logarithmic scale for the Y axis; is  
4 that right?

5 A. That's correct.

6 Q. You I think stated that the  
7 concentrations, the spread between the  
8 concentrations seems to stabilize around the  
9 late '60s; is that what you said?

10 A. Well, there's -- there's  
11 actually a reason for that.

12 Q. Okay.

13 A. Well, there's a reason why the  
14 curves are closer together in the early  
15 years, and that's because, for example, the  
16 TT-26 plot, this is the model simulated  
17 concentrations at Well TT-26, and the source  
18 of the contaminants at the ABC Cleaners is  
19 some distance away from Well TT-26.

20 And so it takes time for the  
21 results to get down that far. And it's --  
22 you're looking at -- there is a -- an early  
23 arrival, but it's at a really small  
24 concentration as a function of the dispersion  
25 coefficients used in the model.

1                   So just the fact -- and then  
2                   the Tarawa Terrace water treatment plant  
3                   concentrations, those are a function of  
4                   supply wells which are all downgradient.

5                   The point being, it takes time  
6                   for the contaminants to reach those wells  
7                   after it leaves the source and, therefore,  
8                   there's not much spread.

9                   And you can see the same  
10                  narrowing of the band in the -- in the  
11                  probabilistic -- or excuse me -- the  
12                  uncertainty analysis results, which is  
13                  results from the same phenomenon I'm  
14                  describing.

15                 Q.           Okay. If you could please turn  
16                 to Page 5 of that same spreadsheet, which has  
17                 the title ending in 299.xlsx. I'm just sort  
18                 of looking at the bottom row. The date is  
19                 February 1, 1967.

20                         Do you see that?

21                 A.           Yeah.

22                 Q.           So it looks like under the  
23                 point I think 004 reaction rate, the PCE  
24                 concentration in micrograms per liter is  
25                 67.16, and then many further digits; is that

1 right?

2 A. Correct.

3 Q. Okay. And for the ATSDR value,  
4 that's the 0.005, it's 60.37; is that right?

5 A. Correct.

6 Q. And for the Aral value, and  
7 that's the .006, it's 54.3; right?

8 A. Correct.

9 Q. By my math, that's a -- in  
10 terms of percentages, it's a pretty  
11 widespread, don't you think?

12 MS. BAUGHMAN: Object to the  
13 form.

14 THE WITNESS: In terms of  
15 contaminant concentrations which are  
16 log normally distributed, I would  
17 consider that a relatively small  
18 chance spread of values.

19 Q. BY MR. ANTONUCCI: Okay. What  
20 do you mean by contaminant concentrations are  
21 log normally distributed?

22 A. Sure. That means there's a --  
23 a statistical analysis you can run on data.  
24 When a parameter is log normally distributed  
25 means the values cover a very broad range of

1 values over several orders of magnitude.

2 And if you refer to the  
3 rebuttal report, Exhibit 7, this is where I  
4 can -- let's see. Give me a second to find  
5 the page I'm looking at.

6 MS. BAUGHMAN: You can use  
7 these, too, if that helps.

8 THE WITNESS: Okay, I got it  
9 right -- okay. Figure 3 of the  
10 rebuttal report. In this case I took  
11 the 318 observed PCE concentrations  
12 and ran a statistical analysis to  
13 generate a histogram. And if a  
14 parameter is log normally distributed,  
15 you see that classic bell-shaped  
16 curve.

17 And so this clearly indicates  
18 that the PCE values are log normally  
19 distributed, which is very typical of  
20 concentration data, and, therefore --  
21 that's one of the reasons why people  
22 almost always show when they plot  
23 concentration data, use a log scale  
24 for the concentrations.

25 Q. BY MR. ANTONUCCI: When you



1 plot concentrations on a logarithmic scale  
2 like you've done here --

3 A. Yeah.

4 Q. -- numbers that are -- what's  
5 the benefit of using a logarithmic scale?  
6 Can you explain that to me?

7 A. It captures -- given that  
8 there's a high variability in concentration  
9 data and the fact that they are log normally  
10 distributed, it is considered to be the  
11 proper way to -- to show them.

12 And so, yeah, it will -- it  
13 also allows you to -- one of the benefits is  
14 it doesn't compress the lower part of the  
15 plot. So it allows you to get a level of  
16 detail on the very small concentrations that  
17 you wouldn't get in a -- in a -- in a non --  
18 in a normal arithmetic scale.

19 Q. At the higher concentrations,  
20 would the lines be further apart if you had  
21 used an arithmetic scale here?

22 A. Yes.

23 MR. ANTONUCCI: All right. I'm  
24 going to ask that you please mark  
25 Exhibit 11 for identification.

1 (Exhibit 11 was marked for identification.)

2 Q. BY MR. ANTONUCCI: Okay.

3 Dr. Jones, this is ATSDR's Analyses of  
4 Groundwater Flow, Contaminant Fate and  
5 Transport, and Distribution of Drinking Water  
6 at Tarawa Terrace and Vicinity, U.S. Marine  
7 Corps Base Camp Lejeune, North Carolina:  
8 Historical Reconstruction and Present-Day  
9 Conditions Chapter F: Simulation of Fate and  
10 Transport of Tetrachloroethylene (PCE).

11 Have you seen this before?

12 A. Yes.

13 Q. And for the record, this  
14 document has the Bates range  
15 CLJA\_WATERMODELING\_01-0000093047 through  
16 93114.

17 Dr. Jones, could you please  
18 turn to Page F28 of this report. That's the  
19 page with Bates number ending in 93086.

20 A. Sure.

21 Q. Thanks very much.

22 All right. So I am reading on  
23 the last full paragraph of Page F28. This  
24 says "The PCE concentrations at water-supply  
25 Well TT-26 on September 25, 1985, and

1 July 11, 1991, were 1,100 and 350 micrograms  
2 per liter, respectively, and the elapsed time  
3 was 2,151 days (Table F2). Applying these  
4 data to Equation 3 yields a degradation rate  
5 of 0.00053 per day. Potentiometric levels  
6 shown on Figure F7 and F8 indicate that Well  
7 TT-26 is located on a direct advective  
8 pathway from ABC One-Hour Cleaners. Thus,  
9 PCE mass migrates downgradient toward and  
10 away from Well TT-26. To the extent  
11 migration of PCE mass toward and away from  
12 Well TT-26 occurred at about equal rates from  
13 1985 to 1991, the compound degradation rate  
14 of 0.00053 per day approximates a long-term  
15 average degradation rate. On the other hand,  
16 if a significant quantity of the PCE degraded  
17 in the vicinity of Well TT-26 was replaced by  
18 advection, then a degradation rate computed  
19 using Equation 3 is probably a minimum rate.

20 "Half-lives of PCE reported in  
21 the literature range from about 360 to  
22 720 days (Lucius and others 1990). Applying  
23 these half-lives to Equation 3 yields  
24 first-order degradation rates ranging between  
25 .001 and .002 per day, about twice to four

1 times the rate computed using concentrations  
 2 at water-supply Well TT-26. An initial  
 3 first-order degradation rate of 0.00053 per  
 4 day was applied to the MT3DMS model uniformly  
 5 to every layer for all stress periods. The  
 6 final calibrated degradation rate was 0.00050  
 7 per day, similarly applied."

8 Did I read that correctly?

9 A. Yes.

10 Q. So it seems that Robert Faye,  
 11 the author of this report, is saying that a  
 12 higher degradation rate here could be  
 13 warranted; is that right?

14 MS. BAUGHMAN: Object to the  
 15 form.

16 THE WITNESS: It looks to me  
 17 like he's -- if that's who wrote this,  
 18 explaining the logic that was used to  
 19 calculate the degradation rate that  
 20 was used in the model, .0005.

21 Q. BY MR. ANTONUCCI: Is there a  
 22 reason that you did not calculate -- or  
 23 perform sensitivity analysis using the values  
 24 from this portion of Chapter F?

25 MS. BAUGHMAN: Object to the

1 form.

2 THE WITNESS: We were asked to  
3 perform an evaluation using the three  
4 values specified.

5 Q. BY MR. ANTONUCCI: Who asked  
6 you to do that?

7 A. The legal team.

8 Q. All right. You can put that to  
9 the side. Thanks, Dr. Jones.

10 All right. Dr. Jones, did you  
11 review the model parameters that ATSDR  
12 subjected to probabilistic analysis?

13 A. Yes, I read a summary of their  
14 probabilistic analysis. I'm not sure I  
15 remember all the details, but I did review  
16 that.

17 Q. Beyond reading the summary, did  
18 you -- beyond reading the summary, did you  
19 otherwise evaluate the model parameters ATSDR  
20 subjected to probabilistic analysis?

21 MS. BAUGHMAN: Object to the  
22 form.

23 THE WITNESS: No.

24 Q. BY MR. ANTONUCCI: You used all  
25 the same model parameters in your post-audit

1       that ATSDR used in the calibrated model; is  
2       that right?

3             A.       Correct.

4             Q.       Did you perform any independent  
5       evaluation of the appropriateness of those  
6       parameters?

7             A.       No.

8             Q.       Okay. Dr. Jones, are you aware  
9       of any critiques of ATSDR's Tarawa Terrace  
10      model?

11            A.       Yes.

12            Q.       Okay. Well, first, which  
13      critiques are -- are you aware of?

14            A.       The critiques first and  
15      foremost by the Department of Justice experts  
16      we reviewed earlier.

17            Q.       Are you aware of any other  
18      critiques of ATSDR's Tarawa Terrace model?

19            A.       I know that there was a review  
20      by an NRC panel. There was a review by a --  
21      a peer review by a panel of experts. I'm not  
22      sure I would call those critiques, but  
23      they're reviews. And I'm aware of -- of a  
24      paper published by Prabhaker Clement in The  
25      Groundwater Journal.

1           Q.       Are you familiar with critiques  
2       that the Department of the Navy has made of  
3       ATSDR's Tarawa Terrace model?

4           A.       Yes, I've seen reference to  
5       those as well.

6           Q.       Okay. Are you aware of any  
7       other critiques of ATSDR's Tarawa Terrace  
8       model?

9           A.       Not that I can think of at the  
10      moment.

11                   MR. ANTONUCCI: All right. I  
12      am going to mark for exhibit -- for  
13      identification Exhibit 12.  
14      (Exhibit 12 was marked for identification.)

15           Q.       BY MR. ANTONUCCI: For the  
16      record, this document has the Bates range  
17      CLJA\_HEALTHEFFECTS-0000000479 through 517.

18                   Can you look up at me,  
19      Dr. Jones, after you've finished looking  
20      through that.

21           A.       Sure.

22                   MS. BAUGHMAN: Did you want him  
23      to read it or just flip through it?

24           Q.       BY MR. ANTONUCCI: Dr. Jones,  
25      you've mentioned you're aware of the NRC

1 critique of -- or the NRC's review of the  
2 Camp Lejeune modeling done by ATSDR; is that  
3 right?

4 A. That's correct.

5 Q. Have you read this before?

6 A. I have skimmed through it, and  
7 I can't say I've read every part of it, no.

8 Q. You cited to this in your  
9 rebuttal report, didn't you?

10 A. Yes.

11 Q. How did you decide which  
12 portions to read carefully and which portions  
13 to skim?

14 A. I -- there were in the -- I  
15 remember reading in the documents somewhere a  
16 rebuttal to this from Morris Maslia, and so  
17 I -- I read -- I was aware with -- of some of  
18 the concepts in -- in this document and in  
19 the rebuttal.

20 And in the context of the -- of  
21 the post-audit that we did, there were some  
22 sections that seemed relevant to things we  
23 were discussing.

24 Q. Okay. Dr. Jones, you agree  
25 that the basis used for setting the values of



1 calibration targets was unclear for ATSDR's  
2 TT model?

3 A. Yes.

4 Q. I ask that you turn to Page 49  
5 of the Exhibit 12.

6 A. Okay.

7 Q. I am looking at the one, two,  
8 three, fourth bullet point from the top.

9 Do you see that? The sentence  
10 starting with "The PSOpS."

11 A. Uh-huh.

12 Q. This says "The PSOpS modeling  
13 study is based on the premise that an  
14 optimization model can be used to evaluate  
15 pumping stresses. Without site-specific  
16 pumping data and water-quality data, the  
17 results will be nonunique and uncertain."

18 Did I read that correctly?

19 A. Yes.

20 Q. That's a correct statement,  
21 isn't it?

22 MS. BAUGHMAN: Object to the  
23 form.

24 THE WITNESS: I'm not familiar  
25 enough with the context to say with

1           certainty whether that's a correct  
2           statement or not.

3           Q.           BY MR. ANTONUCCI:   Okay.   Is  
4           this one of the sections that you skimmed or  
5           one of the sections you reviewed carefully?

6           A.           I don't -- I don't recall  
7           reading this specific bullet point.

8           Q.           Okay.   On the next bullet point  
9           down the last sentence says "The difference  
10          indicates that the real system is highly  
11          transient and that the model did not account  
12          for temporal and spatial averaging effects."

13                       That's a correct statement,  
14          Dr. Jones, isn't it?

15                       MS. BAUGHMAN:   Object to the  
16          form.

17                       THE WITNESS:   I'm not willing  
18          to say whether or not that's correct  
19          or not.

20          Q.           BY MR. ANTONUCCI:   Why not?

21          A.           You just read one sentence at  
22          the end of a paragraph, so I'm --

23          Q.           Okay.

24          A.           Asking me whether to say  
25          whether it's true or not, I would need to

1 explore the full context of what they're  
2 describing before I could have an opinion as  
3 to whether or not that's a true statement.

4 Q. Sure. I'll start from the  
5 beginning of that bullet point there. That's  
6 the fifth from the top.

7 It says "Review of water  
8 quality monitoring data indicates substantial  
9 temporal variability even at a single well."

10 You agree with that statement,  
11 don't you, Dr. Jones?

12 A. Yes.

13 Q. Okay. "For example, the seven  
14 measurements taken on Well TT-26 from January  
15 to September 1985 indicates that the  
16 concentrations at this well varied from 3.8  
17 to 1,580 micrograms per liter (see Table  
18 2-8). The model predictions for the same  
19 time frame range from 732 to 804 micrograms  
20 per liter."

21 Did I read that correctly?

22 A. Yes.

23 Q. "The difference indicates that  
24 the real system is highly transient and that  
25 the model did not account for temporal and

1 spatial averaging effects."

2 Did I read that correctly?

3 A. Yes.

4 Q. Now that you've seen the full  
5 paragraph, are you willing to offer an  
6 opinion about the validity of the last  
7 sentence?

8 MS. BAUGHMAN: Object to the  
9 form.

10 THE WITNESS: I'm not sure what  
11 they mean by "temporal and spatial  
12 averaging effects." The fact that the  
13 simulated concentrations differ from  
14 the observed concentrations which vary  
15 quite significantly is a phenomenon  
16 that we've discussed at length in  
17 our -- both our post-audit report and  
18 our rebuttal document.

19 There's a -- there are very  
20 good reasons why one wouldn't expect  
21 an exact match between the simulated  
22 and observed values and why there  
23 would be much greater variance in the  
24 observed values versus the simulated  
25 values.

1           Q.           BY MR. ANTONUCCI:   Okay.   We'll  
2   get into all of those reasons a little bit  
3   later.   I'd like to continue reading.   This  
4   is the second-to-last bullet point on Page 49  
5   of Exhibit 12.

6                       It says "Reporting absolute  
7   predicted concentrations of PCE and its  
8   biodegradation byproducts in finished water  
9   delivered by the Tarawa Terrace water-supply  
10   system with a precision of up to five  
11   significant figures without any error bounds  
12   (for example, Jang and Aral [2008] report  
13   concentrations of PCE at 102.10 micrograms  
14   per liter, TCE at 4.33 micrograms per liter,  
15   DCE at 13.75 micrograms per liter, and vinyl  
16   chloride at 7.50 micrograms per liter)  
17   provides an unwarranted sense of certainty.  
18   Such reporting can contribute to  
19   misconceptions by the public and the  
20   epidemiology-research community such that  
21   water-modeling efforts can produce a specific  
22   value for contaminant concentration.   Posting  
23   such precise point estimates for PCE, TCE,  
24   DCE, and vinyl chloride concentrations on  
25   public web pages ([www.atsdr.cdc.gov/sites/](http://www.atsdr.cdc.gov/sites/)

1 lejeune) and encouraging former Camp Lejeune  
2 marines and their families to find the  
3 estimated exposure concentrations of these  
4 contaminants leads to a misleading perception  
5 that reactive transport models can make  
6 accurate predictions."

7 Dr. Jones, is it your opinion  
8 that providing numbers such as the ones  
9 mentioned in this paragraph without error  
10 bars can provide an unwarranted sense of  
11 certainty?

12 MS. BAUGHMAN: Object to the  
13 form. Outside the scope.

14 THE WITNESS: I think that  
15 depends on the context.

16 Q. BY MR. ANTONUCCI: Okay. The  
17 last bullet point on this page, that's  
18 Page 49 of Exhibit 12, says "In the absence  
19 of data, historical reconstruction efforts  
20 that use groundwater models can only provide  
21 a general conceptual framework for what  
22 happened at the site and why. At best, such  
23 models may be used only to estimate a range  
24 of possible concentrations. Without  
25 historical geochemical data, the uncertainty

1 associated with many of the input parameters  
2 (such as the biodegradation parameters) could  
3 be very high. In addition, current  
4 understanding of subsurface reactive  
5 transport processes is inadequate, so"  
6 reactive -- excuse me -- "so transport models  
7 cannot be expected to provide definitive  
8 concentration estimates especially for  
9 biodegradation by products."

10 Did I read that correctly?

11 A. Yes.

12 Q. Okay. That's a true statement,  
13 isn't it, Dr. Jones?

14 MS. BAUGHMAN: Object to the  
15 form. That's about five statements,  
16 it's not one.

17 THE WITNESS: Yeah, well, I  
18 think this, as is the case with some  
19 of the reviews, may tend to  
20 overestimate, overstate the absence of  
21 data. I think they did have quite a  
22 bit of data to use to build the flow  
23 and transport model. Certainly enough  
24 to make it a reasonable and valuable  
25 model.

1                   And I think they did a  
2                   reasonable job of simulating or  
3                   estimating the uncertainty in the  
4                   model through their Monte Carlo  
5                   analysis and presenting that to the  
6                   public in their reports.

7                   Q.           BY MR. ANTONUCCI: Do you agree  
8                   that in the absence of data, historical  
9                   reconstruction efforts that use groundwater  
10                  models can only provide a general conceptual  
11                  framework for what happened at the site and  
12                  why?

13                  MS. BAUGHMAN: Object to the  
14                  form.

15                  THE WITNESS: No, I don't agree  
16                  with that.

17                  Q.           BY MR. ANTONUCCI: Why not?

18                  A.           I think it -- it's -- I --  
19                  where's the part you read again?

20                  Q.           That's the first sentence of  
21                  the last bullet point on --

22                  A.           Okay.

23                  Q.           -- Page 49 of Exhibit 12.

24                  A.           I think they can go beyond  
25                  providing a general conceptual framework, as



1 was done in the case here.

2 I think what they did with the  
3 historical reconstruction is a perfectly  
4 valid application of groundwater and  
5 contaminant transport model.

6 Q. What's your understanding of  
7 what the NRC is?

8 MS. BAUGHMAN: Object to the  
9 form.

10 THE WITNESS: National Research  
11 Council. It's a -- it's part of the  
12 National Academy of Sciences.

13 Q. BY MR. ANTONUCCI: Is the NRC a  
14 well respected institution?

15 MS. BAUGHMAN: Object to the  
16 form.

17 THE WITNESS: Generally it --  
18 they -- they use experts in their  
19 work.

20 Q. BY MR. ANTONUCCI: Are you  
21 aware that Dr. Clement served as a reviewer  
22 for this report?

23 A. Yes.

24 Q. Earlier you mentioned you're  
25 familiar with a critique of ATSDR's water

1 modeling efforts from -- by Dr. Clement; is  
2 that right?

3 A. That's correct.

4 Q. Do you have any opinions on  
5 that article?

6 A. I do.

7 Q. Okay. What are they?

8 A. Well, as I mentioned, Professor  
9 Clement is a good friend of mine and he has a  
10 habit of writing thought -- thought-provoking  
11 issue papers. And he has a number of these  
12 over the years that are meant to push buttons  
13 and stimulate conversations.

14 He typically asks me to review  
15 his draft manuscripts of his issue papers and  
16 we have a lot of fun discussing the issues,  
17 and he enjoys getting reactions and getting  
18 people to talk about things.

19 I did not review this  
20 particular article when he published it, nor  
21 have we had extensive conversations about it,  
22 but it certainly follows the pattern. And if  
23 you read his response to Morris' response, in  
24 the opening paragraphs he does indicate that  
25 one of his objectives was to stimulate

1 conversation with that.

2 That being said, when I read  
3 the paper, it seemed that a lot of his  
4 critiques were -- were directed at the  
5 TechFlow -- use of the TechFlowMP model in  
6 the modeling study. And in fact he -- I  
7 recall he suggested that a better approach  
8 would be to stick perhaps with MODFLOW and  
9 MT3DMS, which is what we've done in this  
10 study and what I think the -- you know,  
11 certainly what's documented in Chapters C  
12 and F.

13 And I also think he made some  
14 fundamental logical errors in his critique of  
15 the -- of the modeling effort.

16 For example, he stated that  
17 with a hindcasting model, the farther you go  
18 back in time, the greater the uncertainty.  
19 And I -- I do not agree with that, because  
20 probably the most certain state of this model  
21 is 1953 when it started. That's a point in  
22 time when you have a definitive  
23 representation of what the model should look  
24 like.

25 So they -- they had

1 concentration data at the water treatment  
2 plant in the -- in the mid '80s. They had  
3 concentrations at the wells. And so you  
4 could argue that there's -- there's less  
5 uncertain -- there's data at that point.

6 So you're going to from a  
7 state -- a known state to another known  
8 state. And so there's uncertainty along that  
9 path, but you're simulating between two  
10 relatively precise states.

11 Another issue I had with the  
12 model with his analysis is he pointed to  
13 the -- the uncertainty band of the simulated  
14 concentrations at well -- at the Tarawa  
15 Terrace water treatment plant, and he looked  
16 at the -- the narrow band of uncertainty in  
17 the early years of the results as we were  
18 discussing a little bit earlier in this  
19 deposition.

20 And he said this is wrong  
21 because it implies that -- that there's no --  
22 there's very little uncertainty at that point  
23 in time, which is wrong. And I believe  
24 Spiliotopoulos made the same critique about  
25 the narrow band there.

1                   And as I explained earlier,  
2           there's a very important reason why the band  
3           is narrow. The -- the -- that plot shows the  
4           concentrations at the water treatment plant,  
5           which is derived from concentrations at  
6           supply wells that are a significant distance  
7           away from the source.

8                   So no matter what -- no matter  
9           what perturbations or variation you had in  
10          the model in those early stages, you would  
11          get very small concentrations downgradient  
12          during the first few years.

13                  So it has -- has nothing to do  
14          with falsely representing the uncertainty.  
15          That -- the fact that that band is narrow is  
16          a natural mathematical byproduct of the -- of  
17          the geometry and the -- and the physics at  
18          the site.

19                Q.        Okay. Do you have any other  
20          fundamental logical errors that you'd like to  
21          point out?

22                A.        No.

23                Q.        All right. When was the last  
24          time you reviewed the Clement article?

25                A.        I -- a couple of weeks ago,

1 maybe.

2 Q. And you said that you haven't  
3 discussed it with Dr. Clement; is that right?

4 A. That's correct.

5 Q. Why not?

6 A. I figured it would be best as  
7 I'm serving as an expert on this case and  
8 knowing his past involvement to -- to not  
9 have that conversation. Save it for a later  
10 time.

11 Q. You don't think he'd want to  
12 engage with you in a controversial  
13 discussion?

14 A. Oh, I'm sure he would. But I  
15 don't want that to -- my personal  
16 relationship with him to impact my -- my --  
17 my work and my conclusions on this.

18 Q. You mentioned that many of  
19 Dr. Clement's critiques were directed at the  
20 use of TechFlowMP; is that correct?

21 A. In my reading of the article,  
22 that's the -- that's the sense I got. For  
23 example, he -- one of his critiques was we  
24 shouldn't use cutting-edge research -- we  
25 should be careful or reluctant to use

1 cutting-edge research models developed in  
2 academic institutions that haven't been  
3 thoroughly vetted. That certainly would not  
4 apply to -- to MODFLOW and MT3D.

5 Q. Understood.

6 But is it -- is it your opinion  
7 that TechFlowMP has not been thoroughly  
8 vetted?

9 MS. BAUGHMAN: Object to the  
10 form.

11 THE WITNESS: I don't -- I  
12 don't -- I don't think it's been  
13 vetted to the same degree as MODFLOW  
14 or MT3D. That doesn't mean it's not  
15 a -- a -- an accurate and valuable  
16 model.

17 Q. BY MR. ANTONUCCI: Do you have  
18 any opinion on the accuracy and validity of  
19 results generated using TechFlowMP?

20 A. No.

21 Q. You have no opinion either way?

22 A. I haven't studied the  
23 TechFlowMP results. We focused mainly on the  
24 MODFLOW and MT3DS -- MS as -- within the  
25 context of the work were asked to do. Was

1 not asked to evaluate TechFlowMP or study it.

2 Q. Okay. It's my understanding  
3 that TechFlowMP was generated at the Georgia  
4 Institute of Technology by Dr. Aral?

5 A. That's correct.

6 Q. Okay. And that was done for  
7 the purpose of the Camp Lejeune study; right?

8 MS. BAUGHMAN: Object to the  
9 form. Foundation.

10 THE WITNESS: I'm not sure what  
11 it was -- if that's why it was  
12 developed or not. I'm just not -- I'm  
13 not aware.

14 Q. BY MR. ANTONUCCI: Okay. How  
15 many other groundwater modeling projects have  
16 you evaluated that use TechFlowMP?

17 A. I don't recall seeing any  
18 other.

19 Q. This is the only one you've  
20 evaluated that's used TechFlowMP?

21 A. That's correct.

22 Q. Okay. How about published  
23 studies, things you've reviewed in the  
24 literature. Have you seen TechFlowMP used  
25 anywhere else?



1 A. Not that I recall.

2 Q. Okay. All right. I would like  
3 to discuss hindcasting.

4 When I say the word  
5 "hindcasting," what does that mean to you?

6 A. Using a model to look back in  
7 time and characterize what happened in the  
8 past in an aquifer.

9 Q. Okay. ATSDR's groundwater flow  
10 and transport models are hindcasting models;  
11 right?

12 A. That's what they were primarily  
13 developed for, yes, to do a historical  
14 reconstruction is another term for  
15 hindcasting.

16 Q. So the -- would you consider  
17 those terms, "historical reconstruction" and  
18 "hindcasting" to be synonyms?

19 A. Yeah.

20 Q. Have you ever constructed a  
21 historical reconstruction or hindcasting  
22 model?

23 A. Yes.

24 Q. Okay. I think we discussed a  
25 few of those at the beginning of the

1 deposition; is that right?

2 A. Correct.

3 Q. Are there any others that we  
4 didn't already mention?

5 A. Yeah. One in particular, you  
6 may or may not be familiar with the -- with  
7 the Woburn case near Boston, Massachusetts.

8 Early in my career I became  
9 interested in that case after reading the  
10 book A Civil Action and learning about the --  
11 at that site they had PCE contamination in  
12 the groundwater, which then traveled to some  
13 municipal supply wells resulting in a cluster  
14 of childhood leukemia and other things, I  
15 believe, in the -- in the Woburn  
16 neighborhood.

17 And I became very interested in  
18 the case and I read up on it and I contacted  
19 a lot of -- I knew some of the experts who  
20 had been involved in the study, such as  
21 George Pinder, and I contacted a number of  
22 the people who were involved and asked if  
23 they had any data they could share with me.

24 And so I collected a wide  
25 variety of data on the site, which I then put

1 into a website, Woburn hydrogeologic data, or  
2 something I think I called it.

3 And then as I was teaching a  
4 graduate course on contaminant -- on  
5 groundwater modeling, I ended up developing a  
6 series of exercises where each time I teach  
7 the class, we study the case and I have the  
8 students build groundwater models, and then  
9 take opposing sides in the case and critique  
10 each other's models and -- and estimate  
11 the -- whether or not the contaminant would  
12 have reached the wells within a certain time  
13 frame and answer questions like that.

14 I was able to travel to a  
15 symposium at Harvard Law School on the case  
16 and interact with a lot of the people  
17 involved with it, and over the years a number  
18 of other university courses have adapted this  
19 same set of exercises and materials and  
20 content that I developed for this particular  
21 model.

22 MR. ANTONUCCI: I'm showing you  
23 what I will have marked for  
24 identification as Exhibit 19.

25 THE REPORTER: 19?

1 MR. ANTONUCCI: Excuse me, 13.

2 Thank you.

3 (Exhibit 13 was marked for identification.)

4 Q. BY MR. ANTONUCCI: Dr. Jones,  
5 do you recognize this?

6 A. Yes, I do.

7 Q. How do you recognize this?

8 A. This is a part of the Woburn  
9 case study that I just described to you.  
10 This is one of the pieces of information that  
11 I provide to my students.

12 Q. Is this a page from the CE 547  
13 website?

14 A. Yes, it is.

15 Q. Did you -- did you create this  
16 web page?

17 A. Yes, I did.

18 Q. Okay. And have you visited it  
19 in the past?

20 A. Yes.

21 Q. Okay. Have you read the  
22 contents of this web page before?

23 A. Yeah, I wrote this web page.

24 Q. Okay. And do you currently  
25 remember the contents of this web page?

1 A. Yes.

2 Q. Okay. I'd like for you to look  
3 at the italicized text in the center which  
4 starts with the word "First"?

5 A. Yes.

6 Q. This says "First: Had the  
7 plaintiffs established by a preponderance of  
8 the evidence that any of the following  
9 chemicals - TCE, perc, and 1,2  
10 transdichloroethylene - were disposed on the  
11 Beatrice land after August 27, 1968 (in the  
12 case of W.R. Grace, after October 1, 1964,  
13 and the date Well G had opened), and had  
14 these chemicals substantially contributed to  
15 the contamination of the wells before May 22,  
16 1979?"

17 Did I read that correctly?

18 A. Yes.

19 Q. That appears to be from the  
20 jury instructions from Judge Skinner; is that  
21 right?

22 A. Yes. And I took this from the  
23 book A Civil Action published in 1995 by  
24 Harr.

25 Q. Okay. So the question posed to

1 the groundwater modeling experts at Woburn  
2 was whether or not contaminants could have  
3 reached the pumping wells through the  
4 groundwater flow within a certain time frame;  
5 is that right?

6 MS. BAUGHMAN: Object to the  
7 form.

8 THE WITNESS: Can you state  
9 that again.

10 Q. BY MR. ANTONUCCI: The question  
11 posed to the groundwater modeling experts at  
12 Woburn was whether or not contaminants could  
13 have reached the pumping wells through  
14 groundwater flow in a certain time frame;  
15 right?

16 MS. BAUGHMAN: Object to the  
17 form.

18 THE WITNESS: Yeah, I think  
19 that's accurate.

20 Q. BY MR. ANTONUCCI: Okay. Were  
21 the groundwater modelers at Woburn asked to  
22 determine the concentrations of contaminants  
23 in the wells at different points in time for  
24 determining an individual's potential  
25 exposure to contaminants?

1 MS. BAUGHMAN: Objection.

2 Form. Foundation.

3 THE WITNESS: I don't recall.

4 Q. BY MR. ANTONUCCI: You don't  
5 know if the groundwater modelers generated a  
6 list of contaminant exposure doses?

7 A. As part of this initial case,  
8 I -- I'm not sure.

9 Q. Okay.

10 A. I know that this -- after  
11 this -- this civil action was concluded,  
12 there was an extensive study by the -- by the  
13 USGS, there was a model built. It also  
14 became a Superfund site and, you know, there  
15 were a lot of different kinds of analyses  
16 that were performed.

17 I also became friends with a  
18 professor at Ohio State University who  
19 studied this extensively and did a number of  
20 simulations, including calculating the  
21 concentrations at the wells and then putting  
22 those concentrations into a water  
23 distribution model to simulate the  
24 resulting -- the concentrations of water  
25 delivered to different neighborhoods in

1 Woburn, and then he compared that to  
2 incidents of leukemia in the children in  
3 those neighborhoods who were in -- in utero  
4 when they -- their mothers drank the water,  
5 and found a really strong correlation. And  
6 that study was then published in Nature, the  
7 journal Nature and got a lot of recognition.

8 So my point is there -- there  
9 are a lot of different modeling efforts and  
10 analyses associated with this case. It's  
11 been very highly studied.

12 Q. Okay. Specifically for the  
13 question you ask your students --

14 A. Yes.

15 Q. -- the project you ask them to  
16 recreate --

17 A. Yes.

18 Q. -- are they determining  
19 specific concentrations of contaminants at  
20 wells?

21 A. No. I have them focus purely  
22 on travel time and whether or not the  
23 contaminants -- it's more likely than not  
24 that the contaminants would have reached  
25 Wells G and H within the time frame



1 associated with this case.

2 Part of my objective is to --  
3 is to frame a -- you know, the case study  
4 around an amount of work that could  
5 reasonably be done in the course of a  
6 university semester.

7 Q. Sure. The other studies you  
8 were discussing, the I think USGS and  
9 others --

10 A. Yeah.

11 Q. -- those use a EPA net water  
12 distribution system modeling software to  
13 estimate the movement of contaminants through  
14 the water distribution system; right?

15 A. I don't know about the USGS. I  
16 know the study that was done at Ohio State  
17 University did that.

18 Q. Okay. The -- the USGS study --  
19 or what's -- how would you describe your  
20 level of familiarity with that study?

21 A. I know that they -- they built  
22 a groundwater model. I have copies of the  
23 model. I've looked at the model and the  
24 outputs. I looked at the boundary conditions  
25 they found, the -- the conceptual model they

1       used and -- and that -- the manner in which  
2       they built that model informed the guidelines  
3       that I give my students to -- to recreate the  
4       model each semester I -- I teach it. We use  
5       the same basic conceptual model and boundary  
6       conditions used by the USGS. And I believe  
7       we may calibrate to the same data that they  
8       had.

9               Q.       The USGS study did not  
10       determine specific concentrations of  
11       contaminants individuals in Woburn were  
12       exposed to; right?

13              A.       I'm not sure. I don't recall.

14              Q.       The USGS study bifurcated into  
15       two parts; right?

16              A.       The USGS? I'm -- not that I'm  
17       aware of.

18              Q.       The USGS study first looked at  
19       whether contaminants could have possibly  
20       reached the wells, then whether contamination  
21       from the wells would have reached certain  
22       neighbors in different proportions.

23                      Does that sound like your  
24       understanding of the USGS study?

25                      MS. BAUGHMAN: Object to form

1           and foundation.

2                   THE WITNESS: I think you may  
3           be conflating some different things  
4           here. But the -- the description in  
5           this Exhibit 13 was based on the  
6           evidence presented at the original  
7           trial, and in that case there were  
8           modeling -- a modeling expert for the  
9           plaintiffs, another modeling expert to  
10          defense. They had different models  
11          and argued for the merits of each, and  
12          that's the -- that was bifurcated as  
13          described in this -- in this issue.

14                   Now, the -- the other study I  
15          was talking about at Ohio State, that  
16          was purely, to my knowledge, an  
17          academic study. He had a PhD student  
18          that worked on that, and like me, he  
19          became interested in the case and did  
20          that more extensive analysis.

21                   You know, one of the questions  
22          in this case -- this was the late  
23          '80s, early '90s at a time when our  
24          understanding of chlorinated solvents  
25          and their impact on health and how

1           they migrate and degrade in an aquifer  
2           was not as well understood as it is  
3           now, and so there -- that was one of  
4           the -- that was one of the issues in  
5           the case.

6                     And -- and so, again, one of  
7           the questions was does -- do these  
8           contaminants cause the illnesses that  
9           were reported in Woburn.

10                    And so one of the objectives of  
11           the Ohio State study was he was able  
12           to take the -- recreate through the  
13           model simulation the concentrations  
14           that were reaching the supply wells,  
15           and then the next question is once  
16           they're in the supply wells, where did  
17           they go, right?

18                    Because -- and so the EPA net  
19           model -- I believe he used EPA net --  
20           it was a water distribution model  
21           similar to EPA net, then simulated  
22           where -- which specific neighbors and  
23           houses that would go to. And then  
24           they did statistical analysis of the  
25           correlation between that water

1 delivery and the incidents of  
2 childhood leukemia and found a very  
3 strong statistical correlation.

4 Q. Understood.

5 You mentioned that your  
6 students use the same calibration data that  
7 was available to USGS; is that right?

8 A. That's -- I believe so. I  
9 collected my calibration -- I was also in  
10 contact with some of the original experts who  
11 were involved in the litigation, and so I --  
12 whether my calibration data came from the  
13 USGS model or theirs, I'm not positive.

14 Q. Okay. Regardless of where it  
15 came from --

16 A. Yeah.

17 Q. -- can you describe that data  
18 to me?

19 A. Yeah. It -- it is measured  
20 water levels at a number of observation wells  
21 in the Woburn area, and also there's a --  
22 there's a river or a stream that flows  
23 through the -- the valley and the -- there  
24 were some measure -- and I believe this one  
25 was USGS data -- measured the change in flow

1 across that -- between a gauge at the top of  
2 where the model is and a gauge at the bottom  
3 to determine how much water in this case was  
4 gained. There's water flowing from the  
5 aquifer to the river, and the magnitude of  
6 that was measured.

7 So the students calibrate the  
8 MODFLOW model to the water levels at the  
9 observation wells and to the stream  
10 discharges. The discharges to the streams --  
11 stream.

12 Q. Can you use the discharges to  
13 the stream to determine the recharge rate of  
14 the aquifer?

15 A. Yes, it's actually really  
16 helpful because based on the -- the closed  
17 nature of the -- of the site, there's only  
18 one source of water to the aquifer, and  
19 that's through recharge.

20 And then the water leaves the  
21 aquifer by being pumped out through the wells  
22 that are active at the specific point in  
23 time, and also through discharge to the  
24 stream.

25 So, in fact, I instruct my

1 students you can actually back calculate the  
2 recharge in a spreadsheet using a simple  
3 water balance method using that data.

4 Q. What time frame did the water  
5 level data cover that you just discussed?

6 A. I don't recall. I would have  
7 to go back and look and see. But we build a  
8 steady-state model. We don't build a --  
9 actually, I take that back. I have them  
10 build both a steady-state model and then they  
11 have the option to make a transient model,  
12 but the calibration is the steady-state  
13 conditions.

14 Q. Is that because you don't have  
15 well pumping data?

16 A. No -- well, it's partly because  
17 it's -- I don't believe we had water-level  
18 data over a long period of time. And, again,  
19 I have to construct the case study, it's  
20 something that a set of students who are  
21 brand new to groundwater modeling can do over  
22 the course of a semester, so it's -- it's --  
23 it's a small aquifer. It's a contained  
24 system.

25 Q. Sure. Do you -- do you know if

1       that data is available, the well pumping  
2       data?

3               A.       Oh, so we have -- we use some  
4       pumping data in -- in the case, yeah. There  
5       are four wells; there are two industrial  
6       wells and then Wells G and H and the pumping  
7       data's described somewhere in my website.

8               Q.       Do your students calibrate the  
9       model to any contamination concentrations?

10              A.       No.

11              Q.       Were contaminant concentrations  
12       available to the water modelers in the  
13       lawsuit?

14              A.       Yes, I believe so.

15              Q.       Do you know roughly what time  
16       period that data spanned?

17              A.       I don't recall. I know once  
18       they -- similar to the Camp Lejeune case,  
19       once the chlorinated solvents were discovered  
20       in the municipal wells, they -- they shut  
21       down the wells and stopped pumping.

22              Q.       Okay. So there wouldn't  
23       be -- strike that.

24                      I'm sorry, were you going to  
25       continue?



1           A.       Well, that -- there are two  
2       types of concentrations data. There's the  
3       concentration of the water coming out of the  
4       well, which I know they measured that. But  
5       then I think at a later point in time they  
6       went in and started sampling water at  
7       monitoring wells throughout the Aberjona  
8       aquifer and collected a set of concentration  
9       data from that, which was then used to build  
10      the models that were used in the court case.

11           Q.       Okay. Maybe zooming out from  
12      Woburn --

13           A.       Sure.

14           Q.       -- talking about groundwater  
15      modeling in general.

16           A.       Sure.

17           Q.       What are the types of data that  
18      are required to create a historical  
19      reconstruction groundwater model?

20           A.       That depends on the context.

21           Q.       Sure. Would you ideally have  
22      precipitation data for use in creating a  
23      hindcasting model?

24           A.       Ideally, yes.

25           Q.       Okay. And that would help you

1       determine the recharge rate; is that correct?

2           A.       That does inform the recharge  
3       rate, typically, yes.

4           Q.       To calibrate the groundwater  
5       flow model, would you say that you need water  
6       level data?

7           A.       Yes.

8           Q.       And for the flow and transport  
9       model, would you say that pumping schedules  
10      and pumping rates are helpful in creating a  
11      hindcasting model?

12                   MS. BAUGHMAN:   Object to the  
13      form.

14                   THE WITNESS:    I would say,  
15      yeah, any of the major, significant  
16      what we call stresses, sources and  
17      sinks of water you'd want to  
18      characterize as best you can based on  
19      the data that are available to you.

20           Q.       BY MR. ANTONUCCI:   How about  
21      the properties of the aquifer, like porosity  
22      or other parameters similar to that, would  
23      that be helpful in generating a groundwater  
24      model?

25           A.       Yes.

1 MS. BAUGHMAN: Object to the  
2 form.

3 Q. BY MR. ANTONUCCI: Ideally,  
4 where do you get information about the  
5 aquifer properties from?

6 MS. BAUGHMAN: Object to the  
7 form.

8 THE WITNESS: It depends on the  
9 aquifer properties that you're talking  
10 about. One of the ways in which we  
11 get hydraulic conductivity, for  
12 example, is you can go to the site and  
13 perform pump tests where you either  
14 inject water or pump water out of the  
15 aquifer and watch the -- the response  
16 of the aquifer, and from that you can  
17 back calculate or infer the hydraulic  
18 conductivity in the region surrounding  
19 the well.

20 And -- but in some cases we  
21 start with our -- our best estimate  
22 using scientific and engineering  
23 judgment and experience on the  
24 parameters, and then use the feedback  
25 from the calibration data to help

1 inform those results.

2 For example, recharge is hard  
3 to quantify, but once you start  
4 running the model, if your recharge  
5 rate is too high, the whole aquifer  
6 floods and you know that's not  
7 realistic; where if your recharge rate  
8 is too low, your aquifer gets  
9 dewatered.

10 So there are things that you  
11 can do as part of the modeling  
12 exercise to help narrow down a  
13 reasonable range of parameters in your  
14 model.

15 Q. BY MR. ANTONUCCI: Okay. I  
16 would appreciate if you could please turn to  
17 Exhibit 9, Page A27.

18 A. Okay.

19 Q. All right. Page A27 of  
20 Exhibit 9, the title of the table is "Summary  
21 of model-derived values and observed data of  
22 tetrachloroethylene at water-supply wells,  
23 Tarawa Terrace U.S. Marine Corps Base Camp  
24 Lejeune, North Carolina; is that right?

25 A. That's correct.

1           Q.       And it looks like this graph  
2 shows the model-derived values versus the  
3 observed data at Tarawa Terrace; is that  
4 correct?

5           A.       Correct.

6           Q.       Is it your understanding that  
7 this is all of the water supply well data  
8 that ATSDR had available?

9           A.       I would assume so.

10          Q.       Okay. And this is 36 data  
11 points; right?

12          A.       Yes.

13          Q.       Okay. And it looks like they  
14 were taken in 1985 and 1991; correct?

15          A.       Correct.

16          Q.       Okay. Now I'd appreciate if  
17 you could turn to Exhibit 6, that's your  
18 initial report.

19          A.       Okay.

20          Q.       And if you could please look at  
21 Page 7 in Roman Numerals vii, it's the  
22 Executive Summary.

23          A.       This is Exhibit 6?

24          Q.       Yes.

25          A.       Oh, sorry, I thought you said

1 7-I. Okay. Got it.

2 Q. Okay. I'm reading from the top  
3 of Page 7, the sentence starting with the  
4 word "Despite."

5 A. Yes.

6 Q. It says "Despite the inherent  
7 challenges in simulating complex subsurface  
8 conditions and dealing with incomplete data,  
9 the model effectively simulates long-term  
10 trends in contaminant migration."

11 Did I read that correctly?

12 A. Yes.

13 Q. What did you mean by "the  
14 inherent challenges in simulating complex  
15 subsurface conditions"?

16 A. I think I would probably use  
17 this sentence to describe just about any  
18 groundwater modeling project that I've been  
19 familiar with over the course of my career.

20 When we're looking at  
21 groundwater models, we always have -- we're  
22 dealing with something that's underground,  
23 that you can't directly touch and measure,  
24 and so the whole process is based on building  
25 the model as best you can from the available

1 data that you have and overcoming, in a  
2 reasonable fashion, the -- the lack of more  
3 continuous data.

4 Q. Okay. And what did you mean by  
5 "dealing with incomplete data"?

6 A. What I just described. I --  
7 there -- I've never in my 34 years in this --  
8 in this profession and my career encountered  
9 a case where someone built a model and said,  
10 By golly, we had all the data we needed for  
11 this project, right?

12 You're always dealing with  
13 incomplete data. But there are standard,  
14 established procedures on how to do that and  
15 how to assess uncertainty in those cases and  
16 how to -- again, I -- I previously -- I  
17 mentioned that recharge, which is very hard  
18 to measure directly.

19 And so we use indirect methods  
20 to -- to pin down the -- the level of  
21 recharge. That process is used in multiple  
22 ways in building models.

23 MR. ANTONUCCI: Is this  
24 Exhibit 14?

25 THE REPORTER: Yes.

1 MR. ANTONUCCI: Okay. I'm  
2 handing you Exhibit 14.  
3 (Exhibit 14 was marked for identification.)

4 Q. BY MR. ANTONUCCI: Dr. Jones,  
5 have you seen this before?

6 A. It certainly looks familiar,  
7 yes.

8 Q. Where have you seen this  
9 before?

10 A. That would appear to be a  
11 poster. I believe I presented this at the  
12 American Geophysical Union meeting, annual  
13 meeting.

14 Q. Could you please turn to the --  
15 THE VIDEOGRAPHER: Sorry, can  
16 you...

17 Q. BY MR. ANTONUCCI: Could you  
18 please turn to the page with the title  
19 "Augmenting Sparse Groundwater Level Data  
20 With Earth Observations via Machine Learning"  
21 with the multiple text box -- text boxes on  
22 it.

23 A. Sure.

24 Q. I believe that's the second  
25 page.



1           A.       Oh, okay, yeah.

2           Q.       If you could look at the box  
3           entitled "Data Gaps"?

4           A.       Yes.

5           Q.       Here this says "Monitoring  
6           wells are often samples at irregular or  
7           sporadic intervals. It is not uncommon for  
8           monitoring wells to be abandoned, or to have  
9           quite brief periods of record. We may have  
10          only one or two years of information from the  
11          well. How can we use machine learning to  
12          best make use of what little data we have?"

13                   Did I read that correctly?

14          A.       Yes.

15          Q.       So according to this poster,  
16          one or two years of information from a well  
17          is a brief period of record; right?

18                   MS. BAUGHMAN: Object to the  
19          form.

20                   THE WITNESS: Depending on the  
21          context.

22          Q.       BY MR. ANTONUCCI: Okay. Are  
23          you currently researching ways to address the  
24          issue of sparse groundwater level data and  
25          groundwater modeling by using machine

1 learning?

2 A. Yes, although I would  
3 characterize it as the -- the primary  
4 objective of the research we're doing here  
5 with this algorithm is to help scientists and  
6 water managers accurately determine how their  
7 groundwater storage is changing over time so  
8 that they can determine if their groundwater  
9 resources are being used sustainably.

10 And one of the challenges in --  
11 in generating a time history of aquifer  
12 storage change is we have to work with water  
13 levels measured at wells, and some wells have  
14 a -- a -- a relatively complete record over a  
15 long period of time.

16 Other wells have -- may go  
17 years between measurements or have  
18 measurements that only cover a short time  
19 span. And we're exploring machine learning  
20 algorithms that combine the data you do have  
21 with satellite data, earth observations to --  
22 to intelligently infer the missing data so  
23 that you can more accurately build an aquifer  
24 storage versus time curve that can be used by  
25 water managers to address aquifer

1 sustainability.

2 Q. Okay. And to be totally clear,  
3 machine learning is not something that was  
4 applied to ATSDR's Tarawa Terrace groundwater  
5 flow or transport model; right?

6 A. Not to my knowledge.

7 Q. You can put that exhibit aside.  
8 Thanks, Dr. Jones.

9 A. Sure.

10 Q. Is it fair to say that a  
11 modeler's goal might be to keep a model  
12 simple enough to be manageable yet complex  
13 enough to be useful?

14 A. That's a -- that's a common  
15 expression we use, yes.

16 Q. Okay. And would you agree with  
17 the phrase that one should start simple and  
18 build in complexity only as needed?

19 A. Yes, in general.

20 Q. Okay. That's sort of the  
21 theory underpinning model parsimony; right?

22 MS. BAUGHMAN: Object to the  
23 form.

24 THE WITNESS: Yeah, that's --  
25 that -- model parsimony is having the

1 right level of -- the level of  
2 complexity in your model warranted by  
3 the purpose of the model and what it's  
4 going to be used for and the -- the  
5 nature of the site that you're  
6 modeling.

7 Q. BY MR. ANTONUCCI:

8 Theoretically, it's true to say that there  
9 are an infinite number of combinations of  
10 model parameters that will calibrate the same  
11 model; right?

12 MS. BAUGHMAN: Object to the  
13 form.

14 THE WITNESS: It depends on the  
15 context. Not in -- there are certain  
16 circumstances where that could apply,  
17 but it's not true as a general  
18 statement.

19 Q. BY MR. ANTONUCCI: Okay. What  
20 is the problem of nonuniqueness in the  
21 context of groundwater modeling?

22 A. Depending on how a model is  
23 built, if -- if you have -- for example, let  
24 me refer back to the -- earlier I mentioned  
25 that we can use stream flow data to pin down

1     our recharge value.

2                 Suppose you have an aquifer  
3     where all you have are water level  
4     measurements and no -- no -- no estimates on  
5     discharge, and that -- that could become a  
6     little more problematic in pinning down your  
7     recharge value.

8                 And so there are certain  
9     conditions where if a -- if the conceptual  
10    model is overly simplistic or your boundary  
11    conditions are not well posed, you can  
12    achieve a mathematical situation where, for  
13    example, you could plug in any value of  
14    hydraulic conductivity and get the same heads  
15    out of it.

16                So it's something that modelers  
17    need to be aware of. It's something that I  
18    teach in my groundwater modeling class. But  
19    it -- it's -- I certainly would never say  
20    that for any given model there are an  
21    infinite number of parameters that would  
22    reasonably calibrate it.

23                Q.     It is fair to say, though, that  
24    multiple sets of model input parameters could  
25    calibrate to a single set of observed data;

1 right?

2 MS. BAUGHMAN: Object to the  
3 form.

4 THE WITNESS: I -- again, it  
5 depends on the context. I wouldn't  
6 say that as a general statement.

7 MR. ANTONUCCI: I'm going to  
8 introduce Exhibit 15.

9 (Exhibit 15 was marked for identification.)

10 Q. BY MR. ANTONUCCI: Dr. Jones,  
11 you've seen this before, haven't you?

12 A. It looks like one of my exams,  
13 yes.

14 Q. Okay. I'll represent to you  
15 that I pulled this off the website for your  
16 groundwater modeling class.

17 Are you familiar with the  
18 content of this exam?

19 A. Yes, I am.

20 Q. Okay. You've seen it before?

21 A. Yes.

22 Q. And you currently know what the  
23 information on this exam is; right?

24 A. Yes.

25 Q. Okay. I'd like you to look at

1 Question 4, please.

2 A. Yes.

3 Q. It reads "(calibration) Model  
4 non-uniqueness occurs when:" Answer: "b.  
5 Multiple sets of model input parameters will  
6 calibrate to a single set of observed data."

7 Did I read that correctly?

8 A. That's correct.

9 Q. Okay. That means there could  
10 be more than one calibrated model that fits a  
11 given data set; right?

12 A. You notice the way that's  
13 phrased, "model uniqueness occurs when."  
14 That -- basically there are certain  
15 conditions, depending on how the model was  
16 built, where the model can end up being  
17 nonunique. That doesn't mean that all models  
18 are nonunique.

19 Q. So with regard to the ATSDR  
20 model, theoretically a model that sits  
21 outside the uncertainty range of their model  
22 could still be a good fit to the post-audit  
23 data; right?

24 MS. BAUGHMAN: Object to the  
25 form.

1 THE WITNESS: Say that again.

2 Q. BY MR. ANTONUCCI:

3 Theoretically, there could be a model that  
4 sits outside the uncertainty range of the  
5 ATSDR model that is still a good fit to the  
6 post-audit data set; right?

7 MS. BAUGHMAN: Object to the  
8 form.

9 THE WITNESS: I'm sorry, one  
10 more time. I got to make sure I get  
11 the correct answer here.

12 Q. BY MR. ANTONUCCI:

13 Theoretically, there could be a model that  
14 sits outside the uncertainty range of the  
15 ATSDR model that is still a good fit to the  
16 post-audit data set; right?

17 MS. BAUGHMAN: Objection.  
18 Form.

19 THE WITNESS: Not necessarily.

20 Q. BY MR. ANTONUCCI: Dr. Jones,  
21 is a non- --

22 MS. BAUGHMAN: Wait. Were you  
23 finished answering?

24 THE WITNESS: Well -- no. So  
25 from my understanding of what they did



1 is they calibrated the model and got a  
2 set of parameters which best fit  
3 the -- the observed heads and  
4 concentrations, and then in the  
5 uncertainty analysis, they perturbed  
6 those over a wide range of values and  
7 looked at the effect on the -- on the  
8 outcome, the concentrations. That  
9 means they explored a broad range of  
10 models.

11 Now, whether outside of that  
12 range there could be models that --  
13 that would adequately calibrate, I  
14 can't say.

15 Q. BY MR. ANTONUCCI: Okay. Is it  
16 your opinion that the post-audit calibrated  
17 model is the only model that could fit the  
18 data ATSDR had?

19 A. Well, the -- the post-audit was  
20 not a calibration exercise.

21 Q. Excuse me. I'll re-ask my  
22 question.

23 Is it your opinion that ATSDR's  
24 calibrated model is the only model that could  
25 fit the data ATSDR had?

1 MS. BAUGHMAN: Object to the  
2 form.

3 THE WITNESS: I think it's a  
4 model that reasonably and accurately  
5 fits the data that they had.

6 Q. BY MR. ANTONUCCI: Is it the  
7 only one that reasonably and accurately fits  
8 the data they had?

9 MS. BAUGHMAN: Object to the  
10 form.

11 THE WITNESS: I can't say.

12 Q. BY MR. ANTONUCCI: Why not?

13 A. I think it's an overly  
14 restrictive question.

15 Q. Can you explain what would need  
16 to change for you to be able to answer your  
17 question?

18 MS. BAUGHMAN: Object to the  
19 form.

20 THE WITNESS: Well, I would  
21 need you to explain more what you  
22 mean. What are the circumstances that  
23 you're talking about? If you could --  
24 it's a general statement. That's why  
25 I'm nervous about giving a definitive

1           answer.

2           Q.           BY MR. ANTONUCCI: Dr. Jones,  
3           is a nonunique model a useful predictive  
4           tool?

5                       MS. BAUGHMAN: Object to the  
6           form.

7                       THE WITNESS: A model that  
8           is -- it depends on the level of  
9           nonuniqueness. I would say with every  
10          model there's -- there's some  
11          variability in the calibration, right?

12                      It's not a yes-or-no question  
13          whether or not a model is unique.  
14          There are levels of uniqueness. In  
15          fact, there are actual numerical  
16          analyses that you can do to analyze  
17          uniqueness.

18                      When I teach the calibration  
19          section of my groundwater class, we  
20          use the PEST model. And one of the  
21          outputs from the PEST model is a  
22          number, it's a set of eigenvalues and  
23          you can look at that number and  
24          determine its -- it's a measure of the  
25          level of uniqueness.

1                   So if that number is within a  
2                   certain range, you say there's good  
3                   evidence that the model is relatively  
4                   unique. If it's beyond a certain  
5                   range, then it's evidence that there's  
6                   nonuniqueness at play.

7                   But it's not -- that's why I'm  
8                   not comfortable with your question, is  
9                   it's not a -- it's not a black and  
10                  white boundary between unique and  
11                  nonunique models. It's a spectrum.

12                Q.           BY MR. ANTONUCCI: Sure. Did  
13                you evaluate the ratio of eigenvalues that  
14                the calibrated model ATSDR made?

15                A.           No, I did not.

16                Q.           Why not?

17                A.           That would have required  
18                running a PEST simulation. It was -- it was  
19                not within the scope of work that we were  
20                asked to do.

21                Q.           Okay. How can a modeler make a  
22                model more unique?

23                A.           More data. And it's not just  
24                the amount of data, it's the types of data  
25                that you have. For example, with the ATSDR

1 model, the -- they had -- from what I, in my  
2 judgment, was a pretty rich data set to -- to  
3 calibrate the flow model.

4 Then for the transport model,  
5 you know, the initial condition was zero  
6 contaminants represents, you know, one bound.  
7 And on the other end they had a combination  
8 of -- of water levels -- or excuse me --  
9 concentrations at the wells plus the water  
10 treatment data.

11 The combination of the  
12 concentrations at the water treatment plant  
13 plus the concentrations simulated at the  
14 observation wells, in my opinion, makes the  
15 model more unique.

16 Now, I would also argue that at  
17 this point in time we have another 318 point  
18 observations at monitoring wells at a later  
19 date, which I believe the model does a --  
20 does a good job of simulating; therefore,  
21 providing additional evidence for the -- for  
22 the accuracy and uniqueness of the model.

23 Q. Dr. Jones, you agree that it's  
24 impossible to fully characterize and  
25 incorporate all parameters and complexities

1 of a real aquifer system into a discretized  
2 computer model; right?

3 A. Correct.

4 Q. Okay. ATSDR had no  
5 site-specific data for estimating the  
6 distribution coefficient; right?

7 MS. BAUGHMAN: Object to the  
8 form and foundation.

9 THE WITNESS: I'm not -- I  
10 don't know. Not that I'm aware of.

11 Q. BY MR. ANTONUCCI: Would  
12 reviewing Chapter F help you remember?

13 A. It could.

14 Q. Okay. I'd like you to turn to  
15 Page F27.

16 A. Let's see, exhibit -- I'm  
17 getting a stack here.

18 Q. Chapter F is Exhibit 11.

19 A. Okay. Okay.

20 Q. Okay. I am looking at the last  
21 full paragraph on Page F27, starting with the  
22 word "Estimates."

23 A. Yes.

24 Q. This says "Estimates of  
25 retardation factors and distribution

1 coefficients for PCE migration within the  
2 Tarawa Terrace aquifer or Castle Hayne  
3 aquifer are unknown, and initial estimates  
4 applied to the MT3DMS model were based on  
5 literature sources."

6 Did I read that correctly?

7 A. Yep.

8 Q. That help you remember whether  
9 they had data for the distribution  
10 coefficient?

11 A. Yes.

12 MS. BAUGHMAN: Object.

13 Q. BY MR. ANTONUCCI: Okay. Did  
14 they have site-specific data to estimate the  
15 distribution coefficient for the ATSDR TT  
16 model?

17 A. No.

18 Q. Okay. Instead, ATSDR reviewed  
19 literature sources; right?

20 A. Correct.

21 MR. ANTONUCCI: All right. I'd  
22 like to take a break now.

23 THE VIDEOGRAPHER: We're off  
24 the record. The time is 2:42.

25 (There was a break taken.)

1 THE VIDEOGRAPHER: We're back  
2 on the record. The time is 2:56.  
3 This is Media Number 4.

4 Counsel may proceed.

5 Q. BY MR. ANTONUCCI: Dr. Jones,  
6 what is your understanding of how the data  
7 from ATSDR's Tarawa Terrace model was to be  
8 used?

9 MS. BAUGHMAN: Objection.  
10 Form. Foundation.

11 THE WITNESS: So are we through  
12 with this discussion on the --

13 MR. ANTONUCCI: Yep, you can  
14 put that to the side.

15 THE WITNESS: Okay. All right.

16 MR. ANTONUCCI: I'll ask again.

17 Q. What is your understanding of  
18 how the data from ATSDR's Tarawa Terrace  
19 model was to be used?

20 MS. BAUGHMAN: Objection. Form  
21 and foundation.

22 THE WITNESS: From my  
23 understanding, the primary objective  
24 was to do a historical reconstruction  
25 of the PCE concentrations at the



1 Tarawa Terrace water treatment plant  
2 between 1953 and when the plant was  
3 shut down.

4 Q. BY MR. ANTONUCCI: Okay. I'd  
5 ask that you turn to Exhibit 9. That's TT  
6 Chapter A Page A1.

7 A. Exhibit 2?

8 Q. Exhibit 9.

9 A. Did you say Chapter A?

10 Q. Yes. Exhibit 9 is also a copy  
11 of Chapter A.

12 A. I'm sorry. Let me grab your  
13 copy. What page again?

14 Q. A1. That's the page ending in  
15 Bates Number 615652.

16 A. Okay.

17 Q. All right. In the column  
18 underneath the word "Abstract," I'm reading  
19 the third sentence starting with the word  
20 "Because."

21 "Because scientific data  
22 related to the harmful effects of VOCs on a  
23 child or fetus are limited, the Agency for  
24 Toxic Substances and Disease Registry  
25 (ATSDR), an agency of the U.S. Department of

1 Health and Human Services, is conducting an  
2 epidemiological study to evaluate potential  
3 associations between in utero and infant (up  
4 to one year of age) exposures to VOCs in  
5 contaminated drinking water at Camp Lejeune  
6 and specific birth defects and childhood  
7 cancers. The study includes births occurring  
8 during the period 1968 to 1985 to women who  
9 are pregnant while they resided in family  
10 housing at Camp Lejeune. Because limited  
11 measurements of contaminant and exposure data  
12 are available to support the epidemiological  
13 study, ATSDR is using modeling techniques to  
14 reconstruct historical conditions of  
15 groundwater flow, contaminant fate and  
16 transport, and the distribution of drinking  
17 water contaminated with VOCs delivered to  
18 family housing areas."

19 Did I read that correctly?

20 A. Yes.

21 Q. Please turn to Page A98. That  
22 page ends in Page Number 615749.

23 A. Okay.

24 Q. All right. I am looking at the  
25 last paragraph on this page. It looks like

1     it's a question and answer section. Here the  
2     question reads "ATSDR's historical  
3     reconstruction analysis documents that Tarawa  
4     Terrace drinking water was contaminated with  
5     PCE that exceeded the current maximum  
6     contaminant level (MCL) of 5 micrograms per  
7     liter during 1957 and reached a maximum value  
8     of 183 micrograms per liter. What does this  
9     mean in terms of my family's health?"

10           Did I read that correctly?

11           A.     Oh, hang on, I was looking at  
12     the wrong paragraph.

13           MS. BAUGHMAN: Where -- just  
14     tell him -- where are you reading  
15     from?

16           THE WITNESS: The blue  
17     paragraph on the left. I think you  
18     might be on the wrong page. It's A98.

19           MS. BAUGHMAN: I thought he  
20     said 97, okay.

21           THE WITNESS: Okay, yes, I -- I  
22     believe you read that correctly.

23           Q.     BY MR. ANTONUCCI: Okay. Now  
24     I'm looking at the paragraph in black text on  
25     the right next to what I just read.

1 Do you see that?

2 A. Yeah.

3 Q. It reads "ATSDR's exposure  
4 assessment cannot be used to determine  
5 whether you, or your family, suffered any  
6 health effects as a result of past exposure  
7 to PCE-contaminated drinking water at Camp  
8 Lejeune."

9 Did I read that correctly?

10 A. Yes.

11 Q. It goes on to say "The study  
12 will help determine if there is an  
13 association between certain births defects  
14 and childhood cancers among children whose  
15 mothers used this water during pregnancy."

16 Did I read that correctly?

17 A. Yes.

18 MR. ANTONUCCI: Okay. I am now  
19 going to hand you what will be marked  
20 for identification as Exhibit 16.

21 (Exhibit 16 was marked for identification.)

22 Q. BY MR. ANTONUCCI: Okay. For  
23 the record, Exhibit 16 has the Bates range  
24 CLJA\_WATERMODELING\_01-09\_0000033263 through  
25 33326.

1 Dr. Jones, this document has  
2 the title "Analyses of Groundwater Flow,  
3 Contaminant Fate and Transport, and  
4 Distribution of Drinking Water at Tarawa  
5 Terrace and Vicinity, U.S. Marine Corps Base  
6 Camp Lejeune, North Carolina: Historical  
7 Reconstruction and Present-Day Conditions  
8 Response to the Department of the Navy's  
9 letter on: Assessment of ATSDR Water Modeling  
10 for Tarawa Terrace."

11 Dr. Jones, have you seen this  
12 before?

13 A. Yes, I have.

14 Q. Okay. I'm going to ask you to  
15 turn to the page ending in Bates  
16 Number 33272.

17 A. Okay.

18 Q. All right. Looking at the last  
19 full paragraph on that page, this says "To  
20 address the issue of the intended use of the  
21 water-modeling results by the current ATSDR  
22 epidemiological study" --

23 A. Excuse me, I think I might be  
24 on the wrong page. What -- what was the page  
25 number? Is it 33272?

1 Q. Yes, sir.

2 A. And which paragraph are you --  
3 oh, the last paragraph. Okay, I gotcha.

4 Q. So the last paragraph on  
5 Page 33272 of Exhibit 16 states "To address  
6 the issue of the intended use of  
7 water-modeling results by the current ATSDR  
8 epidemiological study, the DON should be  
9 advised that a successful epidemiological  
10 study places little emphasis on the actual  
11 (absolute) estimate of concentration and,  
12 rather, emphasizes the relative level of  
13 exposure. That is, exposed individuals are,  
14 in effect, ranked by exposure level and  
15 maintain their rank order of exposure level  
16 regardless of how far off the estimated  
17 concentration is to be 'true' (measured) PCE  
18 concentration."

19 Did I read that correctly?

20 A. Yes.

21 Q. Okay. So, Dr. Jones, the  
22 paragraph I just read states that a  
23 successful epidemiological study places  
24 little emphasis on the actual absolute  
25 estimates of concentration; right?

1 A. Yes.

2 Q. Okay. In your report you opine  
3 that the model remains a reliable tool for  
4 understanding general trends of contaminant  
5 migration in the Tarawa Terrace region, and  
6 that you can find no significant evidence  
7 that would invalidate the analysis performed  
8 by ATSDR with the original model; right?

9 A. Correct.

10 Q. However, you're not offering an  
11 opinion that the Tarawa Terrace model is a  
12 sufficiently reliable model for determining  
13 quantitative levels of contaminant exposure  
14 for an individual; right?

15 MS. BAUGHMAN: Object to the  
16 form. Foundation. Outside the scope.

17 THE WITNESS: I am not an  
18 expert in epidemiology, so I don't  
19 feel qualified to render an opinion on  
20 that question.

21 Q. BY MR. ANTONUCCI: Okay. So  
22 you're not offering the opinion that the  
23 Tarawa Terrace model can be used to determine  
24 quantitative levels of contaminant exposure  
25 for individuals?

1 MS. BAUGHMAN: Object to the  
2 form.

3 THE WITNESS: I don't believe  
4 I've -- again, my answer's the same.  
5 I'm not an epidemiological expert so I  
6 can't comment on that.

7 Q. BY MR. ANTONUCCI: Can I have a  
8 yes or a no?

9 MS. BAUGHMAN: No -- objection.  
10 You do not have to answer yes  
11 or no.

12 Q. BY MR. ANTONUCCI: Are you  
13 offering the opinion or not?

14 MS. BAUGHMAN: Object to the  
15 form. Asked and answered.

16 THE WITNESS: Could you restate  
17 the question.

18 Q. BY MR. ANTONUCCI: You're not  
19 offering the opinion that the Tarawa Terrace  
20 model is a sufficiently reliable model for  
21 determining quantitative levels of  
22 contaminant exposure for an individual;  
23 right?

24 MS. BAUGHMAN: Objection; form.  
25 Objection; Foundation.



1 THE WITNESS: The -- the  
2 opinions we've rendered on the model  
3 was that in terms of the -- how the  
4 model simulates concentrations at the  
5 water treatment plant, it -- it is a  
6 reasonably accurate model developed  
7 using sound scientific and engineering  
8 principles.

9 How that -- concentrations  
10 resulting from that are then  
11 incorporated in an epidemiological  
12 study is outside my scope of  
13 expertise -- expertise.

14 Q. BY MR. ANTONUCCI: So that is  
15 not an opinion you're offering?

16 MS. BAUGHMAN: Objection.  
17 Form.

18 THE WITNESS: No, that's not an  
19 opinion I'm offering.

20 Q. BY MR. ANTONUCCI: Had you done  
21 a post-audit prior to the Tarawa Terrace  
22 post-audit?

23 MS. BAUGHMAN: Objection to  
24 form.

25 THE WITNESS: In the sense of

1           running a model simulation and  
2           comparing its output to field observed  
3           values, I have done that countless  
4           times.

5           Q.           BY MR. ANTONUCCI:  You just  
6           described calibration, didn't you?

7           A.           In a -- no.  Calibration is  
8           when you then take the results of that and go  
9           back and change the input parameters.

10                       But I would say what I just  
11           described is a subset of what you do for  
12           calibration.  But simply comparing model  
13           outputs to field observed values is -- is a  
14           really simple and very common thing that I've  
15           done countless times.

16           Q.           Have you ever published a  
17           post-audit before?

18           A.           No.

19           Q.           How long did it take you to  
20           perform the Tarawa Terrace post-audit?

21           A.           The initial post-audit we  
22           started in, I believe, early September and  
23           submitted it in late October of 2024.

24           Q.           So roughly a month?

25                       MS. BAUGHMAN:  Objection to

1 form.

2 THE WITNESS: A little over a  
3 month.

4 Q. BY MR. ANTONUCCI: And you did  
5 both a qualitative and quantitative  
6 assessment as part of your post-audit; is  
7 that right?

8 A. That's correct.

9 Q. Are quantitative and  
10 qualitative assessments terms of art applied  
11 to post-audits?

12 A. Excuse me? Terms of art?

13 Q. Are those -- do those terms  
14 have any special significance in the modeling  
15 community?

16 A. Yeah, I would say it's a  
17 relatively standard practice. For example,  
18 one of the most common ways to assess the --  
19 the results of a model calibration is to  
20 visually examine a simulated versus observed  
21 plot and see how close the points plot to  
22 the -- to the -- the line of agreement, which  
23 is what I would call a qualitative assessment  
24 of the goodness of fit.

25 Q. Okay. There are also

1 quantitative assessment of goods of fit;  
2 right?

3 A. Yes.

4 Q. That would include summary  
5 statistics like mean error and mean absolute  
6 error; right?

7 A. And -- yes, and geometric bias  
8 is one of those, yes.

9 Q. Okay. I'd like to discuss  
10 those error metrics in more detail, but first  
11 you issued two reports in this case; right?

12 A. Correct.

13 Q. One was an initial report and  
14 the other was a rebuttal; right?

15 A. Yes.

16 Q. In your rebuttal report you  
17 corrected errors highlighted by  
18 Dr. Spiliotopoulos in his expert report;  
19 right?

20 A. Yes.

21 Q. That included truncation  
22 errors, incorrect mass loading end date, and  
23 an incorrect pumping rate for well RWC2;  
24 right?

25 A. That's correct.

1           Q.       After Dr. Spiliotopoulos  
2 identified errors in your post-audit, did you  
3 go back and confirm that the rest of the  
4 post-audit had been done correctly?

5           A.       We had -- I'm not aware of any  
6 other reason to believe there were errors in  
7 the initial post-audit.

8           Q.       After Dr. Spiliotopoulos  
9 identified errors, did you go back and check  
10 for any others?

11          A.       No.

12          Q.       So you only corrected errors  
13 that Dr. Spiliotopoulos pointed out?

14          A.       That's correct.

15          Q.       Are you aware of any other  
16 model input errors in your post-audit?

17          A.       No.

18          Q.       Are you now confident that  
19 you've found and resolved all model input  
20 errors in your post-audit?

21          A.       I believe so.

22          Q.       Could there be more model input  
23 errors in your post-audit?

24                   MS. BAUGHMAN:  Objection.

25                   Form.

1 THE WITNESS: It's possible.

2 Q. BY MR. ANTONUCCI: Okay.

3 Please turn to your initial report, that's  
4 Exhibit 6. Page 5-1.

5 A. Okay.

6 Q. All right. Are you looking at  
7 the page that has the heading "Results"?

8 A. Oh, sorry. 5-1 did you say?

9 Q. Yes.

10 A. I have it now.

11 Q. Okay. I'm looking at the last  
12 sentence of the first paragraph. It reads  
13 "Before presenting the results, it is helpful  
14 to remember that when simulating the  
15 migration of a PCE contaminant plume using  
16 MODFLOW and MT3DMS, achieving a close match  
17 between simulated and observed concentrations  
18 can be challenging for several reasons."

19 Did I read that correctly?

20 A. That's correct. And what I  
21 was talk- -- what we were talking about in  
22 this case is looking at individual observed  
23 concentrations and expectations regarding how  
24 well the model will reproduce those  
25 concentrations in the simulation on a

1 point-by-point basis.

2 Q. Okay. With all due respect,  
3 Dr. Jones, my question was did I read that  
4 correctly. I need you to limit your answers  
5 to my questions, okay?

6 A. Sorry. Will do.

7 Q. Thank you.

8 You go on to list reasons why  
9 it's helpful to remember that achieving a  
10 close match between simulated and observed  
11 concentrations can be challenging; right?

12 A. Correct.

13 Q. Those four reasons include  
14 complex subsurface conditions, temporal  
15 variability, limitations in model resolution,  
16 and measurement variability; right?

17 A. Correct.

18 Q. Okay. Under the subheading  
19 "Complex Subsurface Conditions," that's  
20 Number 1.

21 A. Yes.

22 Q. You wrote that "The subsurface  
23 environment is inherently complex, with  
24 variations in soil heterogeneity,  
25 permeability, porosity, and hydraulic

1 conductivity. These properties vary  
2 spatially in ways that are not fully captured  
3 in the model, affecting how the contaminant  
4 plume moves through the groundwater system."

5 Did I read that correctly?

6 A. That's correct.

7 Q. Next Number 2, "Temporal  
8 Variability," you wrote "The concentration of  
9 contaminants can change over time due to  
10 factors like seasonal variations in  
11 groundwater flow, biodegradation, chemical  
12 reactions. Simulating these dynamic  
13 processes accurately over the entire  
14 simulation period is challenging."

15 Is that correct?

16 A. Correct.

17 Q. Okay. Number 3 says  
18 "Limitations in Model Resolution: MODFLOW  
19 and MT3DMS rely on discretizing the  
20 subsurface into numerical grids consisting of  
21 cells that represent a subset of the aquifer.  
22 The resolution of these grids can limit the  
23 model's ability to capture fine-scale  
24 variations in plume behavior, particularly in  
25 areas with sharp concentration gradients,



1 small-scale heterogeneities, or preferential  
2 pathways."

3 Did I read that correctly?

4 A. Yes.

5 Q. Number 4 says "Measurement  
6 Variability: The observed concentrations at  
7 observation wells may contain some degree of  
8 measurement error or uncertainty. Field data  
9 collection is subject to variability, which  
10 adds another layer of complexity with trying  
11 to match it closely with model outputs. As  
12 outlined above in Section 4.2, extreme  
13 variations were observed in some of the  
14 measured concentrations used in this  
15 post-audit."

16 Did I read that correctly?

17 A. Yes.

18 Q. Okay. I'd like for you to turn  
19 to your rebuttal report, Page 3-12. That's  
20 going to be Exhibit 7.

21 A. What was the page again?

22 Q. 3-12.

23 A. 3-12. Okay.

24 Q. Okay. Dr. Jones, the second  
25 paragraph on this page reads "We have also

1 generated new versions of each of the tables  
2 and figures from our original post-audit"  
3 reporting -- "report featuring simulated PCE  
4 values, using the updated post-audit  
5 simulation results, processed at full  
6 precision. These results are presented in  
7 Appendix A. The differences in the tables  
8 and figures relative to the original report  
9 are relatively minor overall. The  
10 differences are summarized as follows:"

11 Did I read that correctly?

12 A. Yes.

13 Q. Dr. Jones, this section says  
14 that the differences between the corrections  
15 you made to your post-audit are relatively  
16 minor overall; is that right?

17 A. That's correct.

18 Q. Okay. And the table below that  
19 paragraph summarizes the list of changes to  
20 the tables and figures of your report; is  
21 that right?

22 A. That's correct.

23 Q. Okay. I'd like you to turn  
24 back to your original report, Page vi, six in  
25 Roman numerals. Again, your original report

1 is going to be Exhibit 6.

2 A. Okay.

3 Q. Are you looking at the  
4 Executive Summary?

5 A. Yes.

6 Q. All right. I am looking at the  
7 third paragraph from the bottom beginning  
8 with the sentence -- the phrase "The  
9 extended."

10 Do you see where I am?

11 A. Yes.

12 Q. This reads "The extended MT3DMS  
13 model was found to perform well in simulating  
14 PCE concentrations at monitoring wells across  
15 the study area. The errors are remarkably  
16 well balanced, indicating a good overall fit  
17 between simulated and observed  
18 concentrations."

19 Did I read that correctly?

20 A. Yes.

21 Q. Now, Dr. Jones, for the  
22 purposes of evaluating fit between simulated  
23 and observed concentrations you provided some  
24 summary statistics; is that right?

25 A. Correct.

1 Q. Okay. What is residual error?

2 A. At a particular observation  
3 well location it's the difference between the  
4 model simulated concentration and the  
5 observed concentration.

6 And the way we calculated it,  
7 we took the simulated value minus the  
8 observed value.

9 So if the model overestimates  
10 the concentration, it would be a positive  
11 residual error; if the model underestimated  
12 the concentration, it would represent a  
13 negative residual error.

14 Q. Okay. The mean error is the  
15 average of the residual errors; right?

16 A. That's correct.

17 Q. And mean absolute error is the  
18 average of the absolute value of the  
19 residuals?

20 A. That's correct.

21 Q. The mean error of the initial  
22 post-audit was 21 micrograms per liter;  
23 correct?

24 A. That's correct.

25 Q. The mean absolute error of your

1 initial post-audit was 334 micrograms per  
2 liter; correct?

3 A. That's correct.

4 Q. Dr. Jones, a negative mean  
5 error indicates that a model under predicts  
6 observed values; correct?

7 A. That's correct.

8 Q. A positive mean error indicates  
9 that a model over predicts observed values;  
10 correct?

11 A. Correct, on average.

12 Q. Mean absolute error is also a  
13 metric that's used to evaluate overall fit  
14 between simulated and observed  
15 concentrations; correct?

16 A. It's -- it's a different  
17 statistical measure used to fit -- to analyze  
18 the calibration results, yes.

19 Q. Okay. And the mean absolute  
20 error cannot be negative; right?

21 A. That's correct.

22 Q. For your updated post-audit,  
23 the mean error was 48 micrograms per liter;  
24 right?

25 A. Yes.

1           Q.       That's an increase of  
2       27 micrograms per liter from the original  
3       post-audit results?

4           A.       That's correct.

5           Q.       Did you calculate the mean  
6       absolute error for the updated post-audit?

7           A.       I don't recall.

8           Q.       Your groundwater modeling  
9       software, GMS, provides the summary  
10      statistics automatically, doesn't it?

11          A.       Yes. But to calculate these  
12      errors, we typically just took the -- the  
13      simulated versus observed PCE concentrations  
14      as shown, for example, in Table A1 of the  
15      rebuttal report and did the error analysis  
16      using Excel, Microsoft Excel. It's a very  
17      simple equation.

18          Q.       Okay. So you -- you did that  
19      very simple equation for the initial report  
20      but not the rebuttal report; is that right?

21          A.       Well, I'm sure I have a  
22      spreadsheet with that number in it. Whether  
23      that number was reported in the rebuttal  
24      report, I don't recall.

25                    I would expect that number to

1 be roughly similar to the -- to the value  
2 reported in the initial report, certainly  
3 along the same scale, which is relatively  
4 large considering a large -- indicating a  
5 large variability in the PCE concentrations.

6 Q. But sitting here today, you do  
7 not know the mean absolute error of your  
8 updated -- or your rebuttal post-audit?

9 A. That's correct. I couldn't  
10 tell it off the top of my head.

11 Q. Okay. Earlier you mentioned  
12 geometric model bias as another summary  
13 statistic that could be used to evaluated fit  
14 between simulated and observed  
15 concentrations; is that right?

16 A. That is correct.

17 Q. When a ratio of simulated PCE  
18 concentrations is simulated to observed PCE  
19 concentrations is less than one, that  
20 indicates under-prediction by the model;  
21 correct?

22 A. That's correct.

23 Q. And when the ratio of simulated  
24 PCE concentration to observed PCE  
25 concentrations equals one, that indicates

1 exact agreement; correct?

2 A. That's correct.

3 Q. When the ratio of simulated PCE  
4 concentrations to observed PCE concentrations  
5 is greater than one, that indicates  
6 over-prediction by the model; correct?

7 A. Correct.

8 Q. The further the geometric model  
9 bias is from a value of one, the worse the  
10 agreement between simulated and observed  
11 concentrations; correct?

12 A. That's correct.

13 Q. Okay. I would like to direct  
14 your attention to Exhibit 9, Page A26. And  
15 Exhibit 9 is the Tarawa Terrace Chapter A  
16 report.

17 A. Okay. A26, got it.

18 Q. All right. Do you see Table A8  
19 at the top of the page?

20 A. Yes.

21 Q. Okay. In the one, two -- third  
22 column from the top, in the -- excuse me --  
23 third row from the top in the Resulting  
24 Calibration Statistics column, geometric  
25 model bias is indicated as being equal to 5.8



1       backslash or 3.9.

2                       Do you see that?

3           A.       Yes.

4           Q.       Okay.   ATSDR calculated two  
5       geometric model biases for the Tarawa Terrace  
6       calibrated model; correct?

7           A.       That's correct.

8           Q.       One was the geometric model  
9       bias that used data for TT-23; is that right?

10          A.       Yes.

11          Q.       And that was the 5.9 value?

12          A.       5.8.   It says 5.8 in this  
13       table.

14          Q.       It does.

15                    If you turn to Page A25.   At  
16       the top of the right-hand column I'm reading  
17       the sentence that says "The inclusive  
18       geometric model bias, using data for  
19       water-supply Well TT-23, was 5.9."

20          A.       Okay.

21          Q.       See that?

22          A.       Sure.

23          Q.       "The selected geometric model  
24       bias, omitting data for supply Well TT-23 was  
25       3.9."

1 A. Yes.

2 Q. "Both results, however,  
3 indicate over-prediction by the model."  
4 Did I read that correctly?

5 A. Yes.

6 Q. Dr. Jones, I would like you to  
7 turn to Exhibit 7, that's your rebuttal  
8 report, Figure A2.

9 A. Yes.

10 Q. Okay. And here we're looking  
11 at a graph. On the Y axis we have simulated  
12 PCE concentrations in micrograms per liter,  
13 the X axis we have observed PCE  
14 concentrations in micrograms per liter;  
15 right?

16 A. That's correct.

17 Q. That dashed line in the middle  
18 is where the simulated and observed  
19 concentrations are equal; right?

20 A. That's correct.

21 Q. Okay. Earlier you indicated  
22 that a scatter plot like this one can be used  
23 for a qualitative assessment of the goodness  
24 of fit of a model; is that right?

25 A. Yes.

1           Q.       And that's because you can  
2 visually examine how far the points are from  
3 the one to one line; is that right?

4           A.       Yes, and also the clustering  
5 and -- and distribution.

6           Q.       Okay. Please turn to Figure 5  
7 of your rebuttal report. And that's  
8 Exhibit 7.

9           A.       Okay.

10          Q.       This figure shows the graph  
11 that we were just looking at on the  
12 right-hand side of the page; is that right?

13          A.       Yes.

14          Q.       And it shows a similar plot  
15 from your initial report on the left-hand  
16 side of the page; right?

17          A.       Correct.

18          Q.       In your rebuttal report you  
19 state that while the numbers indicate a high  
20 degree of variance, they're visually more  
21 balanced than the results we originally  
22 presented in the post-audit report; right?

23          A.       Correct.

24          Q.       Quantitatively the updated  
25 post-audit indicates a small increase in the

1 bias compared to the initial post-audit;  
2 right?

3 A. Say that again.

4 MS. BAUGHMAN: Object to the  
5 form.

6 Q. BY MR. ANTONUCCI: The updated  
7 post-audit indicates a small increase in the  
8 bias compared to the initial post-audit?

9 A. Based on the mean error, yes.

10 Q. I'd like you to turn to  
11 Page 3-5 of your rebuttal report. I am  
12 looking at the one, two -- third paragraph  
13 from the top of the page beginning with "In  
14 Section 3.1.2."

15 Do you see where I am?

16 A. Yes.

17 Q. All right. About halfway down  
18 the paragraph a sentence starts with "For the  
19 original post-audit."

20 Do you see that?

21 A. Yes.

22 Q. "For the original post-audit  
23 results we calculated a mean error value  
24 equal to 21 micrograms per liter, indicating  
25 an extremely balanced fit with only a small

1 high bias. For the updated post-audit  
2 results, the mean error equals 48 micrograms  
3 per liter, indicating a small increase in the  
4 bias, but still relatively well balanced  
5 overall."

6 Is that correct?

7 A. That's correct. When you --  
8 when you asked that before, I thought maybe  
9 you were talking of the post-audit versus the  
10 original report, so I apologize for the  
11 misunderstanding. Excuse me, versus the  
12 original model.

13 Q. Please turn to Table A2 in your  
14 rebuttal report. Again, that's Exhibit 7.

15 MS. BAUGHMAN: What page did  
16 you say?

17 MR. ANTONUCCI: Table A2.

18 Q. Are you looking at Table A2,  
19 Dr. Jones?

20 A. Yes.

21 Q. Okay. So this table shows the  
22 monitoring wells, the layer in the model  
23 where the well is screened, mean error, mean  
24 absolute error, and the mean absolute error  
25 category; correct?

1           A.       That's correct.

2           Q.       Okay. Earlier you indicated  
3       that the mean absolute error is the absolute  
4       value of the mean error; correct?

5           A.       No. It's the -- well, yes, you  
6       can calculate it that way, sure.

7           Q.       Okay. I'd like you to take a  
8       look at Well C3.

9           A.       Okay.

10          Q.       Here the mean error is  
11       indicated as being 98 micrograms per liter  
12       and the mean absolute error is indicated as  
13       being 124.5 micrograms per liter.

14                   Do you see that?

15          A.       Yes.

16          Q.       Why are those numbers  
17       different?

18          A.       That is a great question. I'm  
19       not sure.

20          Q.       I'd like you to look at  
21       Well C9. Here the mean error is negative  
22       5.9 micrograms per liter, the mean absolute  
23       error is 6 micrograms per liter.

24          A.       Yes.

25          Q.       Why are those numbers

1 different?

2 A. Because they're displayed using  
3 different significant figures.

4 Q. Okay. I'd like you to look at  
5 Well C13.

6 A. Okay.

7 Q. Here the mean error is negative  
8 555 micrograms per liter, the mean absolute  
9 error is 563.7 micrograms per liter.

10 A. Yes.

11 Q. Why are those numbers  
12 different?

13 A. I'm not sure.

14 Q. Okay. Look at Well C17-D.  
15 Here the mean error is negative 0.2, the mean  
16 absolute error is 0.4.

17 Why are those numbers  
18 different?

19 A. I'm not sure.

20 Q. Okay. If you look at  
21 Well RWC-1, the mean error is 251.9, the mean  
22 absolute error is 252.6; right?

23 A. Correct.

24 Q. Why are those numbers  
25 different?

1           A.       I'm not sure.

2           Q.       If you look at Well RWS-3A, the  
3 mean error is negative 83.8; correct?

4           A.       Yes.

5           Q.       The mean absolute error is  
6 136.4; right?

7           A.       Correct.

8           Q.       Why are those numbers  
9 different?

10          A.       The -- well, you -- when you  
11 calculate the mean error, you calculate the  
12 average of all of the individual errors. To  
13 calculate the mean absolute error, you don't  
14 simply take the absolute value of that  
15 number.

16                   What you do is you take the  
17 absolute value of the individual residuals  
18 one by one and then calculate the mean of  
19 those values. And I suspect the reason there  
20 are some differences here is because of that  
21 difference in how they're calculated. It is  
22 not simply taking the absolute value of the  
23 mean error.

24          Q.       Okay. You did say that  
25 earlier, though; right?



1 A. Excuse me?

2 Q. You said that the mean absolute  
3 error is the absolute value of the mean  
4 error?

5 A. Yes, but on an individual  
6 basis. And so I'm -- I -- if -- if I stated  
7 that misleadingly, then I'm correcting that  
8 now.

9 Q. Okay. Why don't you take a  
10 look at Well S2.

11 MS. BAUGHMAN: Were you -- were  
12 you finished with your answer, Norm?

13 THE WITNESS: Yeah, I think so.

14 MS. BAUGHMAN: Okay.

15 Q. BY MR. ANTONUCCI: All right.  
16 Well S2.

17 A. Uh-huh.

18 Q. Mean error negative 73.8.

19 A. Yes.

20 Q. Mean absolute error 111.6.

21 A. Right.

22 Q. Is that a rounding error?

23 A. No. These -- these are not --  
24 these should not be expected to agree. And  
25 let me explain why.

1           Suppose you had a circumstance  
2       where you had a number of positive residual  
3       errors and a number of negative residual  
4       errors, but somehow they -- they balanced,  
5       right?

6           They -- they -- let's say you  
7       had a negative ten, a negative five, and a  
8       positive ten and a positive five. If you  
9       took the mean of those errors, that would  
10      equal zero indicating a perfect balance.

11          But if you first took the  
12      absolute value of those numbers and then took  
13      the average of that, you'd be averaging ten,  
14      five, ten, and five. And the mean of that  
15      would be 7.5.

16          So, no, the mean absolute error  
17      is not simply the absolute value of the mean  
18      error.

19          Q.      Okay. When you report the mean  
20      absolute error in your -- when you reported  
21      that in your initial report, which method of  
22      calculating did you use?

23          A.      What I just described. You  
24      take the absolute value of the individual  
25      residuals, and then calculate the average of

1       that. There are circumstances under which  
2       your mean error will match the mean absolute  
3       error.

4                       For example, if all of your  
5       errors are negative or if all of your errors  
6       are positive, then your mean error and your  
7       mean absolute error will match, and that's  
8       why it matches in some of these cases but not  
9       others.

10               Q.       Okay. Okay. Another point of  
11       clarification that I'd appreciate, if you  
12       look at Table 1 of your initial report, and  
13       that's going to be Exhibit 6.

14               A.       Okay.

15               Q.       This table shows various  
16       publicly available rainfall data; is that  
17       right?

18               A.       Yes.

19               Q.       Okay. And it shows publicly  
20       available rainfall data from 1995 to 2009;  
21       right?

22               A.       Correct.

23               Q.       At the Wilmington Airport,  
24       Wilmington 7N, and New River MCAF stations;  
25       is that right?

1 A. That's correct.

2 Q. Okay. Okay, I am going to mark  
3 for identification Exhibit 17.

4 (Exhibit 17 was marked for identification.)

5 MR. ANTONUCCI: For the record,  
6 this is the native spreadsheet version  
7 of the document produced with Bates  
8 Number CL\_PLG --

9 MS. BAUGHMAN: Sorry, did you  
10 give me one? I don't have one.

11 MR. ANTONUCCI: Dash  
12 EXPERT\_DAVIS\_0000000203.XL -- excuse  
13 me -- 203. That's the end of the  
14 Bates number.

15 Q. Dr. Jones, are you familiar  
16 with this?

17 A. It looks familiar.

18 Q. This is the rainfall data you  
19 used to calculate the effective rainfall  
20 recharge rate for the post-audit; right?

21 A. I believe so.

22 Q. Okay. Can you please look at  
23 the year 1999.

24 A. Uh-huh.

25 Q. Is there data available there?

1 A. No.

2 Q. Okay. Can you look back at  
3 Table 1 in your initial report.

4 A. Yes.

5 Q. Will you please look at the  
6 year 1999.

7 A. Yes.

8 Q. Is there data available there?

9 A. Yes.

10 Q. For New River MCAF?

11 A. Yes.

12 Q. Can you explain the  
13 discrepancy, please.

14 A. I cannot.

15 Q. Okay. How about the year 2000?  
16 Can you look at the year 2000 on the  
17 spreadsheet that you produced?

18 A. Yes.

19 Q. Is there data available there?

20 A. No.

21 Q. Okay. Can you look at the year  
22 2000 on Table 1 of your initial report.

23 A. Yes.

24 Q. In the New River MCAF column,  
25 is there a value there?

1 A. No -- or excuse me -- yes.

2 Q. It's 50.4; right?

3 A. That's correct.

4 Q. Inches per year?

5 A. Correct.

6 Q. Where did you get that data  
7 from?

8 A. I -- I'm not sure why there's a  
9 discrepancy here.

10 Q. Okay.

11 A. I'd have to investigate it.

12 MR. ANTONUCCI: I'd like to  
13 take another break.

14 THE VIDEOGRAPHER: We're off  
15 the record. The time is 3:47.

16 (There was a break taken.)

17 THE VIDEOGRAPHER: We're back  
18 on the record. The time is 4:06.

19 Q. BY MR. ANTONUCCI: Dr. Jones,  
20 you stated in your initial report that larger  
21 errors tend to be concentrated in the center  
22 of the plume where the simulated  
23 concentrations are greater; is that right?

24 A. Yes.

25 Q. You also said that that's

1 somewhat expected because comparing larger  
2 numbers organically results in larger  
3 differences; right?

4 A. Yes.

5 Q. Concentrations are generally  
6 higher in the center of a plume; right?

7 A. Yes.

8 Q. Could you please turn your  
9 attention to Rebuttal Figure A9. That's  
10 going to be Exhibit 7.

11 A. Okay.

12 Q. Please look at the center pane  
13 of this figure, Model Layer 3. Are you  
14 looking there?

15 A. Yes.

16 Q. Do you see model -- excuse  
17 me -- do you see Well C5, the plot for  
18 Well C5?

19 A. Yes.

20 Q. And that is within the  
21 simulated PCE plume; right?

22 A. Correct.

23 Q. And it's in the portion of the  
24 simulated PCE plume where concentrations are  
25 greater than 500 to 5,000 micrograms per

1 liter; right?

2 A. That's correct.

3 Q. Okay. That's the center of the  
4 plume; right?

5 A. Yes.

6 Q. I'd like you to turn to  
7 Rebuttal Table A1.

8 A. Okay.

9 Q. And if you could please look at  
10 the first two pages of Table A1 in Exhibit 7.

11 A. Which page number?

12 Q. So Page 1. The page number is  
13 Page 1 of 7.

14 A. Okay.

15 Q. And...

16 A. I got it.

17 Q. All right. If you look towards  
18 the bottom of Page 1 of 7, Table A1?

19 A. Yes.

20 Q. Well C5 is the last four rows  
21 of this table; right?

22 A. Yes.

23 Q. And this shows observed versus  
24 simulated concentrations with the error rate  
25 and the absolute error rate; correct?



1 A. That's correct.

2 Q. All of the observed PCE  
3 concentrations for Well C5 are below the  
4 detection limit; isn't that right?

5 A. That's correct.

6 Q. Okay. And then continuing on  
7 to Page 2 of Table A1, we're still looking at  
8 Well C5. That's going to be the first seven  
9 rows of this table?

10 A. Yes.

11 Q. All of the PCE observed  
12 concentrations were below the detection limit  
13 here as well; right?

14 A. That's correct.

15 Q. The calibrated model and the  
16 post-audit both simulated high PCE  
17 concentrations at that well, didn't they?

18 A. Yes.

19 Q. Still in Exhibit 7, your  
20 rebuttal report, I'd like you to turn to  
21 Page 3-13.

22 A. Okay.

23 Q. All right. Under Section 3.7,  
24 Opinion 6 - Post-Audit Robustness. I am  
25 looking at the second full paragraph.

1 Do you see that?

2 A. Yes.

3 Q. Okay. The last sentences of  
4 that paragraph reads "These findings support  
5 our original conclusion that the ATSDR model  
6 was developed using a methodology that is  
7 scientifically sound and accepted within the  
8 scientific community, and it remains a  
9 reliable tool for assessing the impacts of  
10 PCE contamination at Tarawa Terrace."

11 Did I read that correctly?

12 A. Yes.

13 Q. Okay. Dr. Jones, in the  
14 post-audit you used the model input  
15 parameters that were provided to you by the  
16 legal team; right?

17 A. Yes.

18 Q. And you did not independently  
19 evaluate the suitability of those parameters;  
20 correct?

21 A. The -- the parameters in the --  
22 you mean as part of the post-audit? Can you  
23 restate the question, I'm sorry.

24 Q. You did not evaluate the  
25 appropriateness of the model input

1 parameters; correct?

2 MS. BAUGHMAN: Objection.

3 Form.

4 THE WITNESS: I wouldn't say  
5 that.

6 Q. BY MR. ANTONUCCI: You used the  
7 model input parameters that were provided to  
8 you by the legal team; right?

9 MS. BAUGHMAN: Objection.

10 Form.

11 THE WITNESS: Yes, we did.

12 Q. BY MR. ANTONUCCI: Okay.

13 Dr. Jones, earlier in the deposition you  
14 mentioned that you were present via Zoom for  
15 the deposition of Mr. Davis yesterday; is  
16 that correct?

17 A. That's correct.

18 Q. You mentioned that you weren't  
19 present for the entire deposition; is that  
20 right?

21 A. That's right.

22 Q. At what times were you watching  
23 the deposition?

24 A. From about 9:00 to 9:25 a.m.,  
25 and then I jumped on again about 10:50 a.m.

1 and watched the remainder of the deposition.

2 Q. Do you disagree with any of the  
3 opinions that Dr. Jones expressed in his  
4 deposition -- excuse me -- that Mr. Davis  
5 expressed in his deposition?

6 MS. BAUGHMAN: Objection.

7 Form.

8 THE WITNESS: I -- I'm not  
9 going to say that everything he said  
10 was precise or exactly the way I would  
11 have said it, but the general  
12 statements he gave, I -- I think I  
13 would agree with that.

14 Q. BY MR. ANTONUCCI: Were any of  
15 the statements that Mr. Davis gave incorrect?

16 MS. BAUGHMAN: Objection.

17 Form.

18 THE WITNESS: I'm not prepared  
19 to cite specific examples.

20 Q. BY MR. ANTONUCCI: Can you  
21 think of a single instance where Mr. Davis  
22 made an incorrect statement in his  
23 deposition?

24 MS. BAUGHMAN: Objection.

25 Form.

1 THE WITNESS: Nothing  
2 substantive.

3 Q. BY MR. ANTONUCCI: Can you  
4 think of any non-substantive errors in  
5 Mr. Davis' deposition testimony?

6 MS. BAUGHMAN: Objection to  
7 form.

8 THE WITNESS: Not that I could  
9 recite off the top of my head.

10 Q. BY MR. ANTONUCCI: What do you  
11 mean by "substantive"?

12 A. Well, I -- I believe there was  
13 one case where he was talking about the --  
14 when we did the post-audit and he talked  
15 about the calibration target relative to Well  
16 TT-26.

17 In fact, we did not have any  
18 observations at Well TT-26 during the  
19 extended simulation period, so that was not a  
20 correct statement. That's the one that I can  
21 recall, and I believe he may have corrected  
22 himself, but...

23 Q. Dr. Jones, how much have you  
24 billed to date in this case?

25 MS. BAUGHMAN: Objection to

1 form. We've provided the bills.

2 THE WITNESS: I've billed the  
3 amount shown in the invoices that we  
4 submitted.

5 Q. BY MR. ANTONUCCI: Do you know  
6 what that amount is?

7 MS. BAUGHMAN: Object to form.

8 THE WITNESS: I think through  
9 the end of January it would be roughly  
10 \$120,000, I believe.

11 Q. BY MR. ANTONUCCI: Does your  
12 payment depend on the outcome of this case?

13 A. No.

14 MR. ANTONUCCI: Okay. I am  
15 going to show you another exhibit.  
16 This will be Exhibit 18.

17 (Exhibit 18 was marked for identification.)

18 Q. BY MR. ANTONUCCI: This  
19 document has the title "An overview of  
20 current applications, challenges, and future  
21 trends in distributed process-based models in  
22 hydrology"; is that right?

23 A. Correct.

24 Q. There's a list of several  
25 authors here, one of them being Norm Jones.

1 Is that you?

2 A. That's me.

3 Q. Okay. Were you an author of  
4 this study?

5 A. I was a co-author.

6 Q. Okay. Please turn your  
7 attention to Page 5 of Exhibit 18.

8 A. Okay.

9 Q. I'm looking at the very last  
10 sentence on the page starting with the word  
11 "Although." It's -- it continues on to  
12 Page 6.

13 A. Oh, okay, sure.

14 Q. Okay. So this says "Although  
15 some of those process-based hydrological  
16 models include numerous distinct processes,  
17 the degree of complexity and quantity of  
18 processes represented varies between models  
19 and influences the suitability of a given  
20 model for specific applications."

21 Did I read that correctly?

22 A. Yes.

23 Q. You'd agree that a model cannot  
24 capture the complexity of aquifer conditions  
25 completely; right?

1 A. Yes.

2 Q. That they don't necessarily  
3 reflect all real-world conditions; right?

4 A. A model, as we've discussed  
5 earlier, is a simplification of reality.

6 Q. Okay. Would it be possible for  
7 you to have performed a post-audit on the  
8 Hadnot Point/Holcomb Boulevard model?

9 A. Yes, I assume it would be  
10 possible.

11 Q. Okay. And you did not do it  
12 because you weren't asked to by the legal  
13 team; right?

14 A. That's correct.

15 Q. Okay. Finally, I'd -- I'd like  
16 to turn back to our earlier discussion of the  
17 model's ability to predict contaminant  
18 concentrations at TT-26 accurately.

19 Do you remember discussing  
20 that?

21 A. I -- we've discussed that topic  
22 quite a few times today. In general, yes, I  
23 remember discussing that.

24 Q. Okay. It's true that the ATSDR  
25 used a mass balance model for determining



1 concentrations at the water treatment plant;  
2 right?

3 A. That's correct.

4 Q. Okay.

5 A. Based on the concentrations and  
6 pumping rates at the supply wells.

7 Q. It's also true that you did not  
8 have information on the pumping rates for all  
9 times during this study period; correct?

10 MS. BAUGHMAN: Objection.

11 Form.

12 Q. BY MR. ANTONUCCI: Excuse me.

13 It's true that ATSDR did not  
14 have information on pumping rates during all  
15 times of the study period; correct?

16 MS. BAUGHMAN: Objection. Form  
17 and foundation.

18 THE WITNESS: Yes, that is very  
19 standard for groundwater modeling  
20 projects.

21 Q. BY MR. ANTONUCCI: Okay. Would  
22 the process of performing a post-audit for  
23 Hadnot Point/Holcomb Boulevard be different  
24 than performing a post-audit for Tarawa  
25 Terrace?

1           A.       The basic process would be the  
2       same. It would be extended over a -- the  
3       model inputs would be extended over a new  
4       period. We would not change anything in the  
5       original models, other than extending it, and  
6       then run the simulations and compare the  
7       predicted results of the extended model with  
8       any new field observed value data that were  
9       available, is the general process.

10          Q.       The -- the -- ATSDR's  
11       calibrated model's geometric model bias was  
12       lower when considering Well TT-23; right?

13          A.       That's correct.

14          Q.       That's because the ATSDR's  
15       calibrated model demonstrated a worse fit  
16       between simulated and observed conditions at  
17       that well?

18          A.       I think that's safe to say,  
19       yes. Well, actually, the reason why -- I'm  
20       not comfortable saying they didn't consider  
21       it because it had a worse fit. I would say  
22       that the difference in the geometric bias  
23       between the two, the fact that it goes down  
24       if you don't include it would indicate that  
25       it -- it has a high fit at that. But I -- I

1 recall there were -- there were a couple of  
2 reasons why they argued why it may not be  
3 considered, but they presented both values  
4 for consideration, so...

5 Q. Okay. So then ATSDR's  
6 calibrated model had a sort of variable fit  
7 between observed and simulated data at  
8 different supply wells; isn't that right?

9 A. Yes.

10 Q. Okay. Dr. Jones, I think we're  
11 coming up on the end of my questions. Are  
12 there any answers you've given to my  
13 questions you wish to change before we end  
14 this deposition?

15 A. Not that I can think of.

16 Q. Is there any information I  
17 asked you about that you didn't recall at the  
18 time but now remember?

19 A. No.

20 Q. Were there questions I asked  
21 that you did not understand in which I was  
22 unable to clarify?

23 A. Not that I recall.

24 Q. Once it's ready, you will be  
25 provided with a transcript of this

1 deposition. We ask you carefully read,  
2 correct, and sign it.

3 Do you understand that?

4 A. Yes.

5 MR. ANTONUCCI: Well, thank  
6 you, Dr. Jones, for your patience in  
7 answering my questions today.

8 I pass the witness.

9 THE WITNESS: Thank you.

10 MS. BAUGHMAN: Dr. Jones, I  
11 just have a few questions for you.

12 EXAMINATION

13 BY MS. BAUGHMAN:

14 Q. First, let's go to Exhibit 6 of  
15 your -- Exhibit 6, which is your original  
16 post-audit. And if you could turn to  
17 Page 5-1.

18 A. Sure.

19 Q. Okay. And I think you may  
20 remember earlier that counsel for DOJ asked  
21 you some questions about -- or he read parts  
22 of Numbers 1 through 4 under your results and  
23 asked if he'd read it correctly and if these  
24 things were true.

25 Do you recall that?

1           A.       Yes.

2           Q.       Okay.  And so what you have  
3       here under Section 5 Results is you wrote  
4       "Before presenting the results, it is helpful  
5       to remember that when simulating the  
6       migration of a PCE contaminant plume using  
7       MODFLOW and MT3DMS, achieving a close match  
8       between simulated and observed concentrations  
9       can be challenging for several reasons:"  And  
10      you listed four reasons; correct?

11          A.       Yes.

12          Q.       Now, I'm going to ask about  
13      each of them individually, but is your  
14      observation that when simulating the  
15      migration of a PCE contaminant plume using  
16      MODFLOW and MT3DMS, when doing that achieving  
17      a close match between simulated and observed  
18      concentrations can be challenging, is that  
19      limited to Camp Lejeune and the ATSDR's  
20      modeling efforts?

21          A.       No.

22          Q.       What -- to what extent does  
23      that apply to groundwater modeling?

24          A.       The contaminant transport  
25      modeling with MT3DMS, there's always -- or

1       there's typically a very high variability in  
2       the observed concentration data. And the --  
3       the model simulates a plume representing  
4       average conditions over the grid cells and  
5       using some simplifying assumptions.

6                       And so you shouldn't expect it  
7       to -- to precisely match the observed  
8       concentrations at each instance, rather the  
9       overall level of fit is what is most  
10      important to analyze.

11             Q.       And that's true whenever you're  
12      modeling a plume using MODFLOW and MT3DMS;  
13      right?

14             A.       That's correct.

15             Q.       Okay. So if we go to the first  
16      factor, you wrote that "The subsurface  
17      environment is inherently complex, with  
18      variations in soil heterogeneity,  
19      permeability, porosity, and hydraulic  
20      conductivity. These properties vary  
21      spatially in ways that are not fully captured  
22      in the model, affecting how the contaminant  
23      plume moves throughout the groundwater  
24      system."

25                       Is that observation specific to

1 Camp Lejeune and the ATSDR modeling efforts?

2 A. No.

3 Q. Is that statement regarding  
4 complex subsurface conditions generally true  
5 for groundwater modeling efforts using  
6 MODFLOW and MT3DMS?

7 A. Yes.

8 Q. Okay. Or using any model?

9 A. Yes.

10 Q. Okay. Your second factor  
11 listed is "Temporal Variability," and you  
12 wrote "The concentration of contaminants can  
13 change over time due to factors like seasonal  
14 variations in groundwater flow,  
15 biodegradation, and chemical reactions.  
16 Simulating these dynamic processes accurately  
17 over the entire simulation period is  
18 challenging."

19 Is that observation specific or  
20 unique to Camp Lejeune and the ATSDR's  
21 modeling efforts?

22 A. It's a -- it's a general  
23 statement that would be true of any  
24 contaminant transport model.

25 Q. At any location?

1 A. Yes.

2 Q. By any modeler?

3 A. Yes.

4 Q. Okay. Your third reason listed  
5 is "Limitations in Model Resolution." And  
6 you wrote "MODFLOW and MT3DMS rely on  
7 discretizing the subsurface into numerical  
8 grids consisting of cells that represent a  
9 subset of the aquifer. The resolution of  
10 these grids can limit the model's ability to  
11 capture fine-scale variations in plume  
12 behavior, particularly in areas with sharp  
13 concentration gradients, small-scale  
14 heterogeneities, or preferential pathways."

15 Is that observation specific to  
16 ATSDR's modeling efforts at Camp Lejeune?

17 A. No, it's a general statement,  
18 and I think there's evidence of this  
19 specifically at Camp Lejeune.

20 Q. But the limits in modeling --  
21 limitations of model resolution that you've  
22 described here is a limitation that would  
23 apply whenever this type of modeling is done  
24 with MODFLOW and MT3DMS?

25 A. Correct.



1           Q.       Okay. And the fourth factor  
2       you listed is "Measurement Variability," and  
3       you wrote "The observed concentrations at  
4       observation wells may contain some degree of  
5       measurement error uncertainty. Field data  
6       collection is subject to variability, which  
7       adds another layer of complexity when trying  
8       to match it closely with model outputs."

9                   Is that observation unique to  
10       ATSDR's efforts at Camp Lejeune?

11           A.       No.

12           Q.       Is it a general issue on  
13       measurement variability that applies in all  
14       groundwater modeling efforts?

15           A.       That's correct.

16           Q.       Okay. You were asked, I think,  
17       on numerous occasions today by DOJ's counsel  
18       for what purpose ATSDR's modeling effort can  
19       be used, and I want to ask you this: Can  
20       ATSDR's model be used to determine -- let me  
21       strike that.

22                   Is ATSDR's model or models used  
23       for Camp Lejeune sufficiently reliable to  
24       determine the mean monthly concentrations at  
25       the water treatment plant at Tarawa Terrace

1 based on the work that you've done in this  
2 case?

3 A. Yes, I believe so.

4 Q. And was it necessary for you or  
5 for the ATSDR modelers to know how those mean  
6 monthly concentrations would be used by any  
7 health professional, including an  
8 epidemiologist or a toxicologist or a medical  
9 doctor, in order to conduct the modeling  
10 efforts appropriately?

11 A. I can't think of any  
12 circumstances in how they would be used that  
13 would alter the modeling process that went  
14 about building the model and generating those  
15 simulated concentrations at the water  
16 treatment plant.

17 Q. So, in other words, if a MD,  
18 PhD, epidemiologist, medical doctor wanted to  
19 use the mean monthly concentrations to  
20 estimate an individual exposure as opposed to  
21 a group exposure, would that change how you  
22 or Morris Maslia or anyone else conducts the  
23 modeling?

24 MR. ANTONUCCI: Objection.

25 THE WITNESS: No.

1 Q. BY MS. BAUGHMAN: You were  
2 asked a number of questions by DOJ counsel  
3 regarding -- about geometric bias.

4 Do you recall that?

5 A. Yes.

6 Q. Do you know what the geometric  
7 bias was that was calculated for the  
8 concentrations at the water treatment plant  
9 for Tarawa Terrace?

10 A. Yes.

11 Q. What was that?

12 A. 1.5.

13 Q. And that's -- what's your  
14 opinion of that in terms of, you know, good,  
15 bad, accurate, inaccurate, do you have an  
16 opinion?

17 A. I would say in the context of  
18 contaminant transport modeling that would be  
19 a slight high bias.

20 Q. Okay. And did you calculate  
21 the geometric bias related to your post-audit  
22 work?

23 A. Yes.

24 Q. And what was that geometric  
25 bias?

1           A.       I calculated geometric bias for  
2       the 318 observations, and the geometric bias  
3       was 2.1, which is substantially lower than  
4       the 3.9 to 5.9 range that they got with the  
5       original model.

6                   And if you look solely at  
7       observation -- observation -- concentrations  
8       at observation wells that are greater than  
9       5 micrograms per liter, that bias drops to  
10      1.2.

11           Q.       And remind me, 5 micrograms per  
12      liter, why is that number significant?

13           A.       It's the minimum -- it's the  
14      MCL.

15           Q.       Maximum contaminant --

16           A.       Maximum contamination level,  
17      yes.

18           Q.       Set by the EPA?

19           A.       That's correct.

20                   MS. BAUGHMAN:   Okay.   I'll pass  
21      the witness.

22                                   EXAMINATION

23      BY MR. ANTONUCCI:

24           Q.       Dr. Jones, you just testified  
25      that the geometric model bias at the Tarawa

1 Terrace water treatment plant was 1.5; is  
2 that correct?

3 A. That's correct.

4 Q. Where did you get that value  
5 from?

6 A. From the modeling reports.  
7 ATSDR modeling reports.

8 Q. Okay. Can you tell me where  
9 specifically in the modeling reports you got  
10 that value from?

11 A. Well, earlier this afternoon  
12 you had me read from a table, and it was in  
13 that table and a discussion of that was in  
14 the prior page. I believe it's in -- you can  
15 find it in Chapter A, if I recall correctly.

16 Q. Okay. And you also testified  
17 that the geometric model bias of your  
18 post-audit was 2.1; is that correct?

19 A. That's correct.

20 Q. It's true that you calculated a  
21 geometric model bias but not a mean absolute  
22 error of your post-audit; is that right?

23 A. I -- there is a mean absolute  
24 error calculated, I just can't remember what  
25 it was off the top of my head.

1 Q. Okay. And it's not in your  
2 report; correct?

3 A. No, we did not put it in the  
4 report.

5 MR. ANTONUCCI: Okay. All  
6 right. I pass the witness.

7 EXAMINATION

8 BY MS. BAUGHMAN:

9 Q. The geometric bias, is there --  
10 is there a table or a figure in your report  
11 from which one could easily calculate the  
12 geometric bias for the post-audit work?

13 A. Yes. If you take the simulated  
14 versus observed PCE concentrations at the 318  
15 well locations, it's -- it's a simple  
16 spreadsheet calculation.

17 Q. And all of the data necessary  
18 to do that is in your report?

19 A. That's correct.

20 Q. Where? Where?

21 A. It's the -- well, the most  
22 recent and correct version of that would be  
23 in table -- Table A1 of the rebuttal report.

24 MS. BAUGHMAN: Okay. Thank  
25 you.

1 I'll pass the witness.

2 MR. ANTONUCCI: All right.

3 Thank you, Dr. Jones, no further  
4 questions.

5 THE WITNESS: Okay. Thank you.

6 MS. BAUGHMAN: I think we're  
7 finished. Thank you.

8 THE VIDEOGRAPHER: We're off  
9 the record. The time is 4:34.

10 (The deposition was concluded at 4:34 p.m.)

11 -oOo-

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Reporter's Certificate

State of Utah )  
County of Salt Lake )

I, Vickie Larsen, Certified Court  
Reporter and Registered Merit Reporter in the  
State of Utah, do hereby certify:

THAT the foregoing proceedings were  
taken before me at the time and place set  
forth herein; that the witness was duly sworn  
to tell the truth, the whole truth, and  
nothing but the truth; and that the  
proceedings were taken down by me in  
shorthand and thereafter transcribed into  
typewriting under my direction and  
supervision;

THAT the foregoing pages contain a true  
and correct transcription of my said  
shorthand notes so taken.

IN WITNESS WHEREOF, I have subscribed  
my name this 19th day of February, 2025.



Vickie Larsen, CCR/RMR  
Utah License No. 109887-7801  
Nevada License No. 966



In Re: Camp Lejeune Water Litigation  
Case No.: 7:23-CV-00897  
Date: February 14, 2025  
Reporter: Vickie Larsen, CCR/RMR

WITNESS CERTIFICATE

State of Utah )  
ss.  
County of Salt Lake )

I, NORMAN L. JONES, HEREBY DECLARE:  
That I am the witness referred to in the  
foregoing testimony; that I have read the  
transcript and know the contents thereof;  
that with these corrections I have noted this  
transcript truly and accurately reflects my  
testimony.

PAGE-LINE	CHANGE/CORRECTION	REASON
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-----	No corrections were made.	-----

I, NORMAN L. JONES, hereby declare under the  
penalties of perjury of the laws of the  
United States of America and the laws of the  
State of Utah that the foregoing is true and  
correct.

Dated this \_\_\_\_\_ day of \_\_\_\_\_,  
2025.

-----  
NORMAN L. JONES

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